ARCHITECTURAL DRAWING & DETAILING

INCLUDING RENDERING IN PEN AND INK AND LANDSCAPING • A TEXT AND REFERENCE BOOK ON GENERAL PRACTICE AND TECHNIQUE

by

J. RALPH DALZELL, B.S.
Managing Editor, American Technical Society
Head, Architectural Engineering Department, American School

and JAMES McKINNEY
President, American School
Member, National Society for the Study of Education

ILLUSTRATED

1946

AMERICAN TECHNICAL SOCIETY • CHICAGO

The text material of this volume is included in the cyclopedia *Building Estimating and Contracting*

Printed in the U.S.A.

INTRODUCTION

IT IS the purpose of this book to present the general principles, practices, and techniques of architectural drawing, detailing, rendering in pen and ink, and landscaping in such a manner as to serve beginning students, laymen, or draftsmen who are in the need of this practical information.

The general presentation includes a discussion of each principle, followed by simple and thorough directions for procedure. To a great extent, the question and answer method has been used, together with actual working sketches, to illustrate the principles. The pictorial drawings facilitate visualization of standard drawings and details. In addition, a teaching technique has been used whereby the processes are developed step by step with complete sketches and directions. Exercise problems have been supplied and will be found adaptable either for home-study or classroom purposes. We suggest the following method of study:

1. Each section of the book should be read carefully to get a bird's-eye view of its contents.

2. This scanning should be followed by a detailed study of each paragraph.

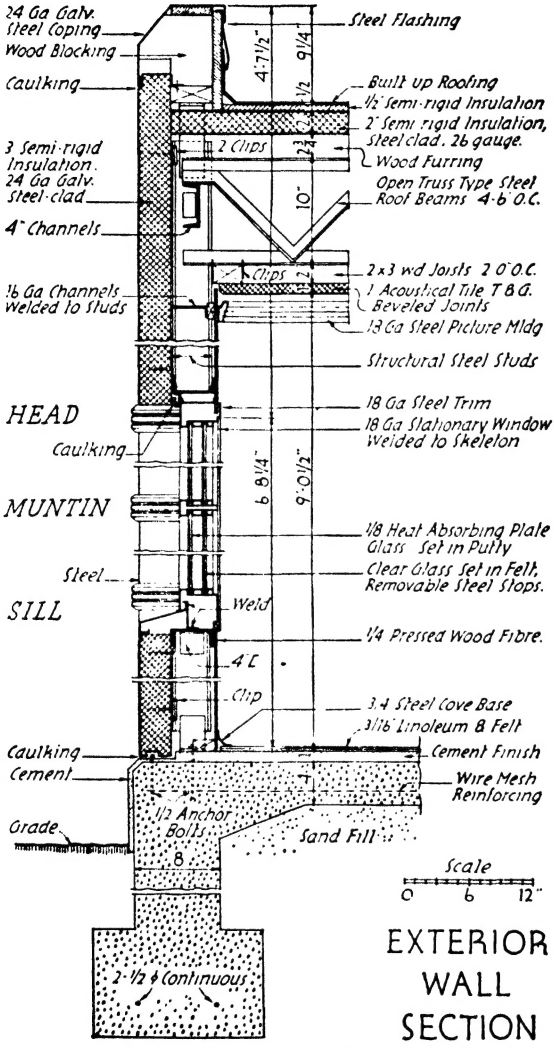
3. The various symbols and conventions should be memorized.

4. There should be constant practice in lettering, line work, crosshatching, arrows, etc., both with pencil and with ink, until the student is able to produce a quality of work equal to that which is shown in the text.

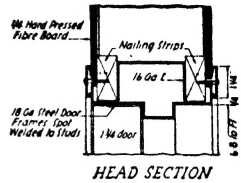
5. All the practice work should be done.

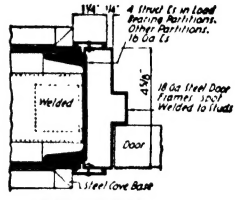
6. The student should learn to be critical of his work when it is completed, continually comparing it with the standards set up in the text.

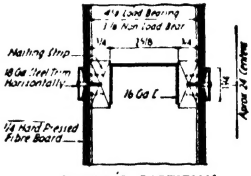
If the above suggestions are carefully followed, the student will acquire a skill as well as a fund of technical knowledge which will be of real service to him in meeting the problems of the architectural draftsman.

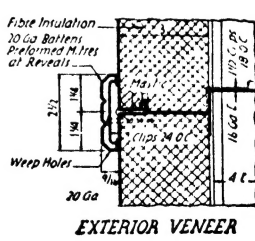


EXTERIOR WALL SECTION









Typical Details

Courtesy of Architectural Forum

CONTENTS

ARCHITECTURAL DRAWING

LETTERING

The study of architectural drafting begins with lettering, as lettering is one of the most important items in the making of a good drawing. Architectural lettering differs greatly from mechanical lettering but knowing mechanical lettering will help to establish skill in architectural lettering. The standard mechanical letter is always the same—stiff and formal in appearance—no matter what draftsman uses it, while the architectural letter is more artistic and less formal in appearance.

Architectural lettering may be divided into two classes: the Classic Renaissance or Old Roman, usually, and the free-hand type.

The Classic letter is seldom used, and only in such cases as details for libraries, public buildings, and where letters are to be executed in stone or bronze. The free-hand capital letter is used almost exclusively for all architectural drafting work, and for this reason the beginning draftsman should spend much time in developing the necessary skill so he can letter rapidly and well.

Good lettering will make an otherwise mediocre drawing appear good, whereas poor lettering will absolutely ruin the appearance of a drawing that is excellent in all other respects. Architectural drawings should be artistic, interesting, and have definite character. Many things are necessary to make this possible, but lettering is by far the most important of them all and for this reason too much attention to lettering cannot be given.

All architectural lettering is vertical and there is no fixed style common to all architecture. It is very seldom that any two draftsmen will be found to use exactly the same style. There are many styles of lettering in common use, but none are standard. Generally a draftsman develops his own particular style which may be correctly used just so long as he makes all letters so they have the same general characteristics. By this is meant that all letters should so resemble each other that it is easy to see they have the same style.

A beginning draftsman should adopt or work up an alphabet of his own which he can study, improve on from time to time, and use in all of his future drafting work. The alphabet should be simple and easy to make, rather than elaborate and difficult. Most architects prefer simple lettering, because it takes less time to make and looks far better on the average drawing. Elaborate lettering on the average drawing tends to give it an overdone appearance, whereas good simple lettering lends it real character and beauty.

Fig. 1 illustrates a style of architectural lettering which is not only very well adapted for the beginner's use but is attractive and suitable for the average drafting work. The letters are not difficult to make, and with the proper amount of careful study and practice

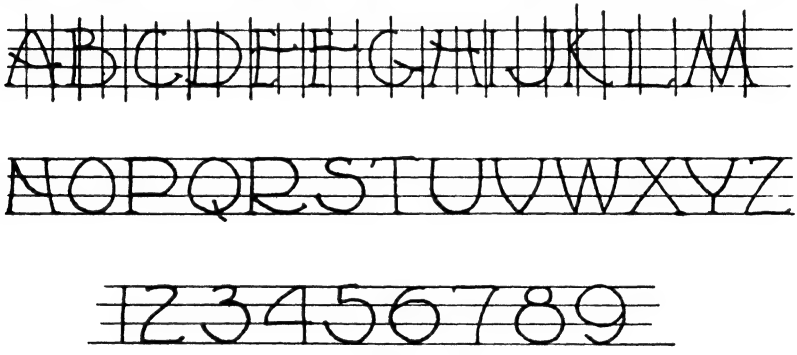


Fig. 1. Architectural Alphabet

the beginner can attain skill in making them. Plates I and II show other styles of architectural lettering.

In architectural lettering, as in all lettering, the use of guide lines is absolutely necessary to keep the lines horizontal and the letters of a uniform height. The most experienced draftsman, as well as the beginner, should use them for every letter or figure on a drawing. The greatest single mistake the beginner can make is to attempt lettering without them. As shown in Fig. 1, the beginner should not only use the horizontal guide lines but also the vertical. The vertical lines, which are put in at random, help to keep the letters vertical. For example, in Fig. 1 note how the nearby vertical guide lines helped when making the vertical lines in the letters E and F. Always measure the distance between the horizontal guide lines, according to the height of lettering desired,

so as to have each line of lettering exactly the same height. Never guess when putting these lines in, because it is not possible to be exact enough by this method.

All guide lines should be drawn very lightly so they will not greatly interfere with the lettering as far as appearance is concerned. In cases where inking is done over the pencil letters, the guide lines can be erased without injury to the inked letters if the lines are light. Use a 5H pencil to draw the guide lines.

The top and bottom of each letter should just touch the top and bottom guide lines as illustrated in Fig. 1. The spacing between the letters and the widths of the letters should be kept as uniform as possible. In all cases where an F is followed by G, the space between them should be a little smaller than usual, due to the large amount of vacant space under the crossarm of the F. A uniform distance between letters, except in such cases as above, gives the lettering a uniformity that is pleasing to the eye. However, do not attempt to actually measure these distances with a scale but judge them by the eye, as a very slight variation is more pleasing than accurate mechanically-measured distances.

Most of the letters should be the same width. The exceptions to this rule are the M and W, which are slightly wider due to their construction, and the I, which is narrower. In keeping letters uniform, the use of a pair of dividers will prove helpful. Set the dividers to the desired width and put down two small marks on the plate which will indicate how wide the letter is to be. In the case of I, M, and W, the width can be made slightly narrower or wider by guess. The beginner should watch these points very closely and as he becomes more experienced he will do the right things automatically.

The formation of the letters is very important, because it is necessary to keep all the letters the same general style. There are numerous things which determine the style of lettering, but only the most important will be discussed here.

Between the top and bottom guide lines, the space is divided into three equal parts and lines are drawn as shown in Fig. 1. These spaces, called thirds, are used in the formation of letters, and the beginner should always use these as well as the horizontal and vertical guide lines.

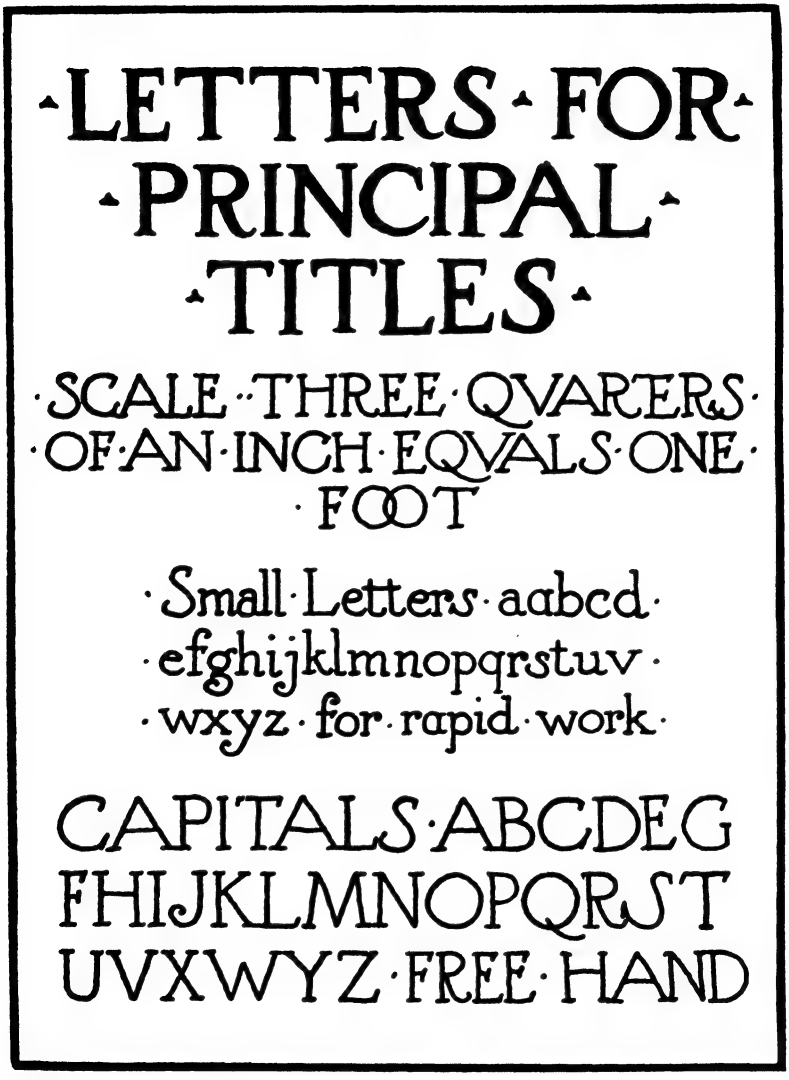


Plate I. Different Styles of Architectural Alphabet
Courtesy of Claude Fayette Bragdon, Architect, Rochester, New York

Plate II. Panel Showing Single-Line Italic Letters
Courtesy of Claude Fayette Bragdon, Architect, Rochester, New York

In every alphabet there are a few letters which necessarily determine the style of all the letters in that particular alphabet. In the alphabet illustrated in Fig. 1, the O and Q are the style determining letters. If you will note the shape of these two letters carefully, you will see that they are slightly egg-shaped, the large end being at the bottom. The sides of these letters are not perfect arcs, because the letters are not perfect circles; but the sides have a circular tendency which is carried out in all the other letters. These letters, being egg-shaped, appear slightly bottom heavy. In other words, one end of the letter is larger than the other, the bottom two-thirds being the larger portion. This is another characteristic carried out in the complete alphabet. In this alphabet, trials have shown that by making either the top or the bottom two-thirds of each letter the larger, the character of the O or Q can be maintained. Whether it is the top of the letter or the bottom which is the larger depends on the individual letter and the draftsman's taste.

In Fig. 1 the letter A is formed with slightly circular sides and the crossarm on the lower third. The crossarm is also slightly circular. The letter spreads out from the top toward the bottom so that the lower two-thirds is the larger. The sides curve outward to conform to the style and because the outward slope gives the letter more strength than an inward slope would. Thus it is seen that the A conforms to the style determined by the O and Q.

The bottom two-thirds of the letter B is the larger and its sides are conforming to the style of the O, Q, and A. The top two-thirds of the letter B could have been made the larger and still conformed to the style, but such a formation would not be in good taste. Thus it is seen that style and taste must work hand in hand in the formation of letters.

It is easy to see that the letters C and D conform to the style, having circular sides and with their bottom two-thirds the larger.

E and F have their crossarms at the upper third. The crossarms curve, the tails on the upper and lower arms curve, and in general the letters conform to style. These letters would not look well with their crossarms on the lower third and they would not follow the style if their crossarms were in the middle. Here again style and taste govern the formation.

The H has slightly curving sides, a curving crossarm at the upper third, and is larger at the bottom than at the top. K follows the same principle. In these letters, style determines the location of the crossarm and intersection.

The letters M and W are made slightly wider than the other letters because of their construction. A trial will quickly show how badly they would look if they were made narrower. These two letters conform to style with their sloping sides and by being larger at the top and the bottom, respectively.

A study of the balance of the alphabet will show how the other letters are constructed so as to look well and conform to style, and the use of the third lines. It is well to make a careful study of these letters before you start to draw them or to form a new alphabet.

All of the figures 1 to 0 have the same general characteristics as the letters. It will be seen that they are larger either at the top or the bottom, that there is considerable curvature in their formation, and that thirds are used in their making. Figures are difficult to make and for that reason much time and practice should be spent on them.

The beginner will find lettering a real task which requires patience and determination. Skill cannot be obtained in any other way than by careful practice day after day. It is well to put a great deal of practice on lettering before attempting any drafting in this lesson, because no drawings will look well unless the lettering is good. In Fig. 2 is shown a good form to use for practice work. Any cheap paper may be used and the plate should be as nearly the size of your drawing board as possible. Rule up the entire sheet with guide lines as shown in Fig. 2, and then make at least one line of letters and figures across the sheet each day. It is best to practice on scrap paper first. Try to spend at least fifteen minutes a day on lettering, for the more time you spend the better the letters you will make. Using a practice plate will make it possible for you to compare one day's work with another. Try to improve each day.

When making letters in pencil, use a 4H pencil; keep it well sharpened at the point and do not press down hard on the pencil. Make very light lines so they can be gone over and over, if necessary, until the correct formation of the letter has been accomplished.

In cases where inking is to be done over the pencil letters, try to improve the shape of each letter when inking. Do not make the line weights very heavy. A good medium weight line will prove satisfactory. A study of the lettering in the illustrations in this text will show this.

In cases where a tracing is going to be made from a pencil drawing, the pencil drawing should have all the guide lines and

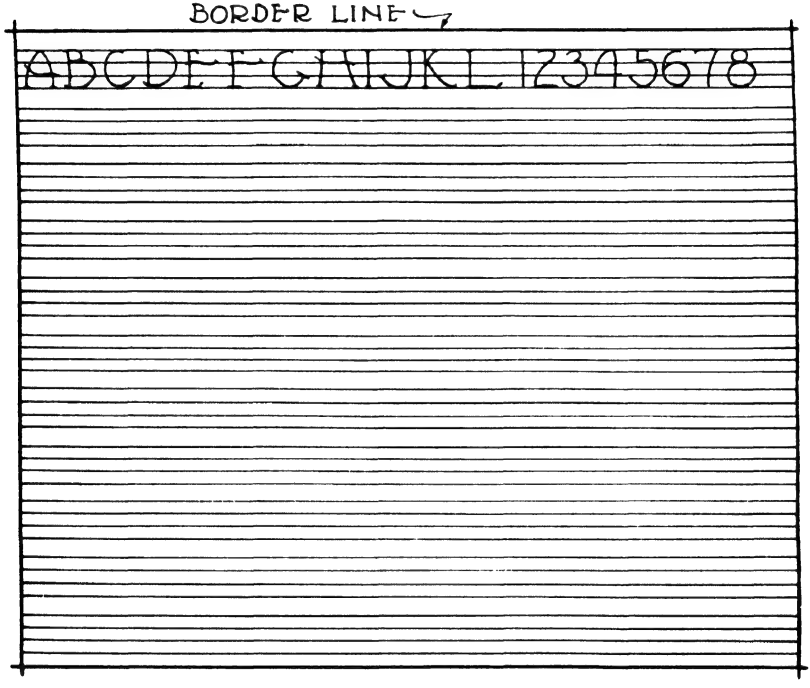


Fig. 2. Lettering Form for Lettering Practice

lettering done completely in pencil. Then when the tracing is inked, an improvement can be made in the inked letters over the pencil letters. Try to keep the lettering on a tracing rather light with unbroken lines, because all breaks show up plainly on blueprints.

Ink lettering requires more practice than pencil work does. Hold the pen very lightly and do not press down on it. Keep the pen clean by the use of a damp cloth. Do not put much ink on the pen at one time and use the quill to put ink on the pen instead of

dipping the pen in the bottle. Practice ink lettering on a large sheet of paper the same as you have for pencil work. It is advisable for the beginner to purchase a few different pen points and make trials with each to determine which point better suits his taste. When one particular point has been decided on, it will be well to purchase a supply of them. After using a pen and before putting it away, always see that the whole point is thoroughly cleaned. This preserves the pen and prevents its rusting. Rust on the pen causes ink to flow too rapidly. Never blot inked lettering, but allow it to dry naturally.

In Fig. 1 it will be noticed that all the letters have tails on them. This gives a finishing touch to the letter and improves its appearance greatly. For example, in the letter A, the bottom ends of both sides are finished with short horizontal lines and the crossarm line is finished at each end by a very slight dot, which not only improves the appearance but also makes a better letter for blueprinting.

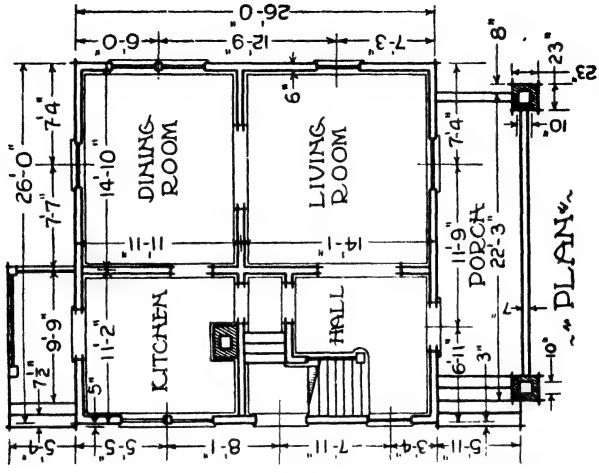
Before going further in this lesson, it is advisable to spend as much time as is necessary to attain fairly good lettering, and then keep practicing daily. Lettering is very important and deserves very careful attention.

ARCHITECTURAL TERMS

Architectural drawing is a medium of expression used to convey ideas from one person to another. It is a drafting language made up of lines and symbols. Architectural drawings are not made full size, but are made to a definite small scale. Because the drawings are small compared with the objects they picture, the various parts cannot be drawn out in detail, but are shown by the use of symbols. The main divisions of architectural drawing are plans, elevations, sections, details, and perspective.

A plan is a horizontal section through a building taken just above the window sills, as shown in the isometric view in Fig. 3. A plan for each floor is taken in the same manner. The plan should show all the horizontal dimensions, symbols, etc., as illustrated.

An elevation corresponds to the front or side view in mechanical drawing, and is the vertical projection of the sides of a building.



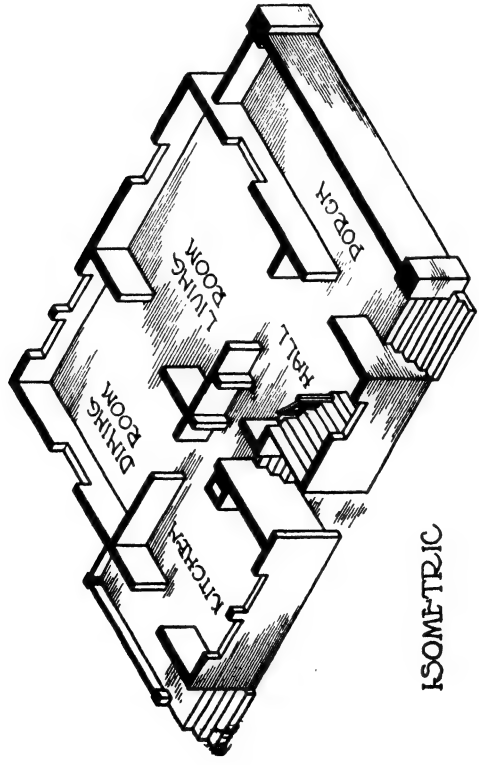


Fig. 3. Isometric and Plan Views

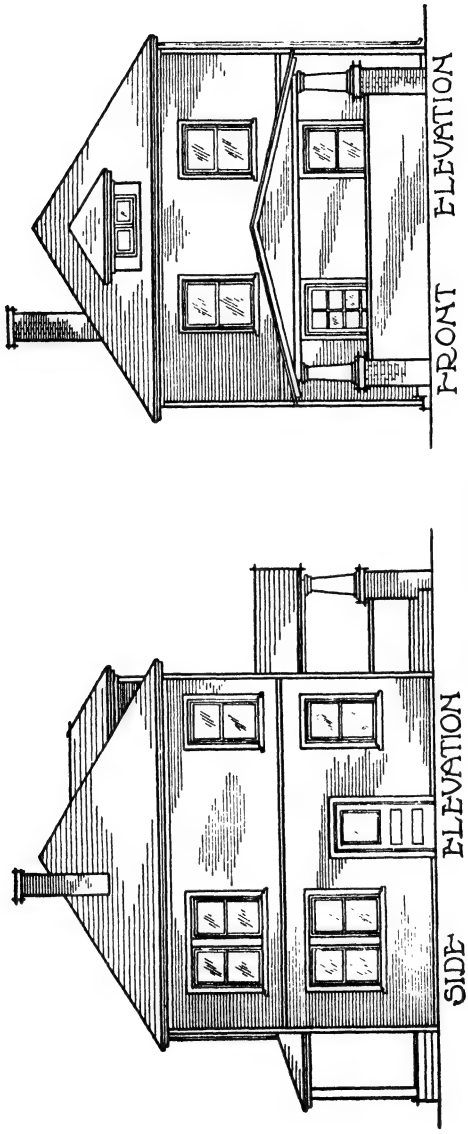


Fig. 4. Elevation Views

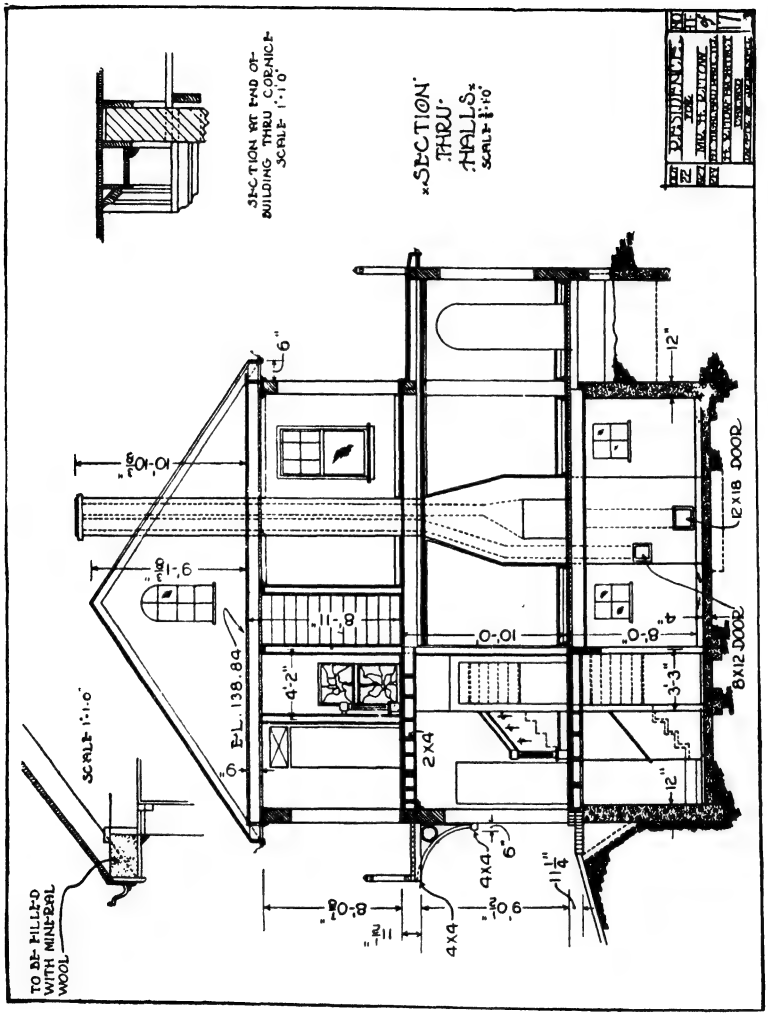


Plate III Section through Halls

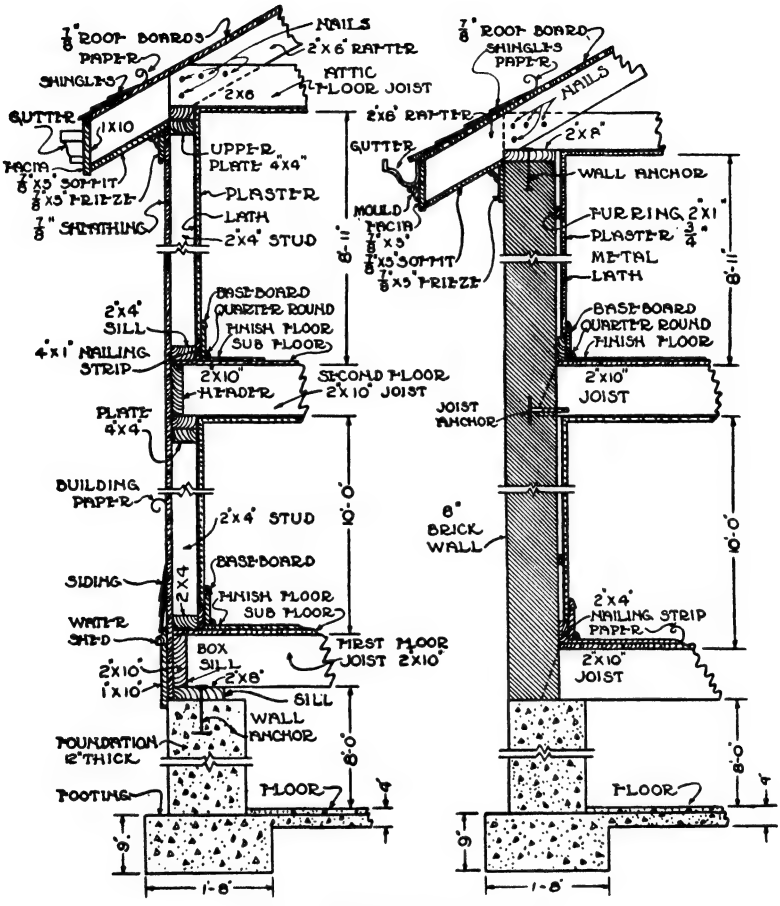


Plate IV. Vertical Section through Walls

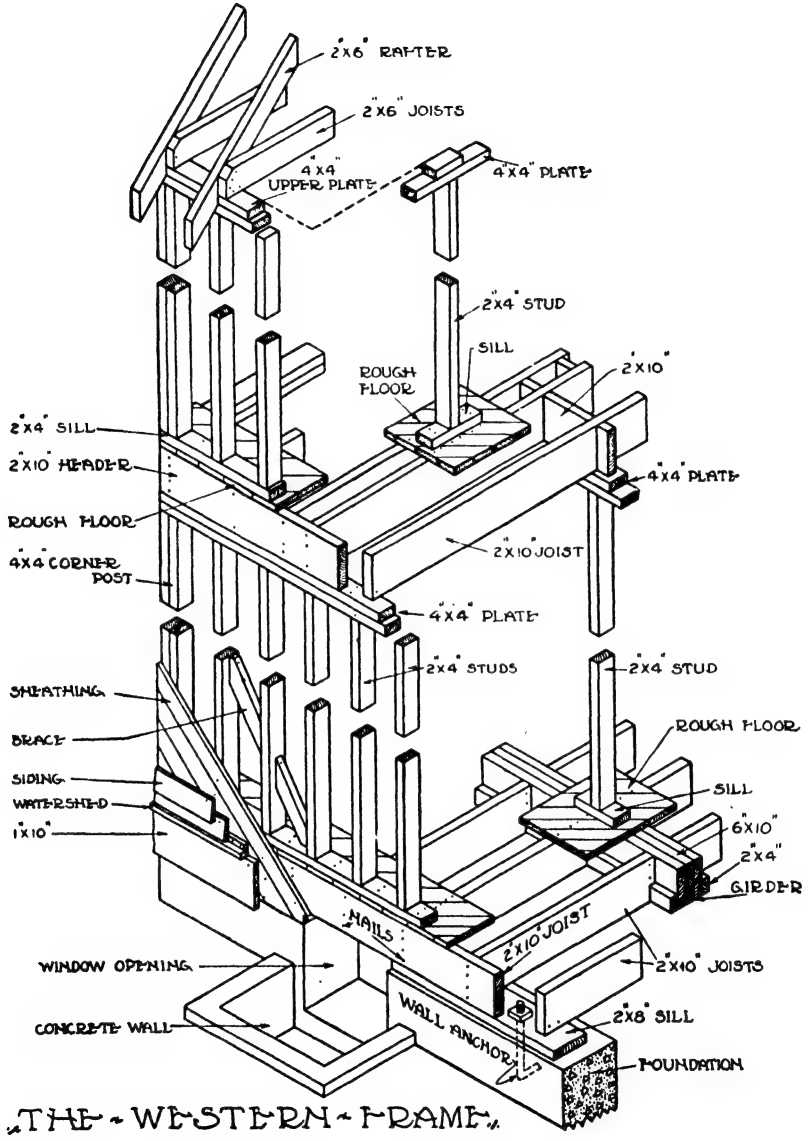


Plate V. Isometric View, Showing Pictorially the Section of the Wall on the Left-Hand Side of Plate IV.

The names on the Isometric View correspond to those on the Section. This Isometric View gives a better idea of how the framing is put together.

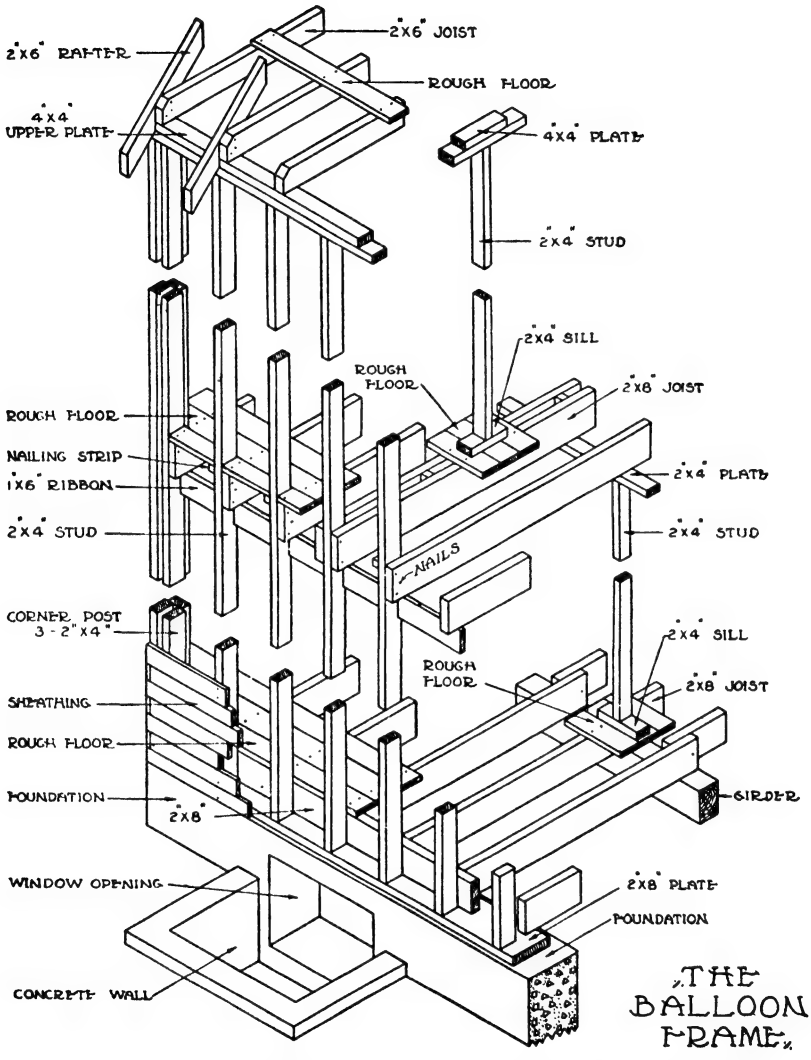


Plate VI. Isometric View of a Different Type of Framing than Shown in Plate III

An elevation shows exactly what can be seen, for example, when standing directly in front of a building. Fig. 4.

A section is a vertical section through a building taken in much the same manner as a horizontal section. See Plates III, IV, V, and VI. We may also draw sections which will illustrate their entire structure just the same as if the structure had been sawed through with a saw and one of the cut portions illustrated.

A detail is an enlarged drawing of one portion of a building, showing clearly the dimensions and such other information as is necessary and which are not shown on the full or assembly drawing. See Fig. 32.

USE OF SCALE

Drawing to Scale. The scale is an instrument of measure by means of which you can reduce a large object to a smaller size and still keep it in direct proportion and in exactly the same shape as the original large object. The working drawings for a proposed structure must be drawn to a convenient size to handle and also so as to get a good mental picture of the structure. It can easily be understood how impossible it would be to draw plans full size, even for a small garage. This drawing of plans to a small size is known as drawing to scale.

When making a drawing of a structure the dimensions of which are given in feet, it is necessary to adopt some proportionate part of a foot to use on the drawing in place of feet. And the size of a drawing will depend upon just what part of a foot it is decided to use as the unit of measure. Suppose that the size of the paper is $12'' \times 12''$ and that on this paper it is desired to draw an object twice that big, or $24'' \times 24''$. It is very evident that the drawing cannot be full size and that it must be drawn to scale.

When determining what scale to use for a proposed drawing, it is necessary to take three things into consideration, namely, the size of the paper, the overall dimensions of the object to be drawn, and the clearness of the reduced drawing. The size of paper is important, because a drawing can only be as big as the paper will permit. There must also be room for dimensions and notes. The correct procedure is to determine the overall dimension and then try different scales until a suitable one is found. The clearness of

a drawing is perhaps the most important consideration and the drawing will not show the small details of the object clearly if drawn to a very small scale. For ordinary architectural work, use the $\frac{1}{4}''$ or $\frac{3}{8}''$ scale. In cases of very long overall dimensions, large paper should be provided rather than use a scale smaller then $\frac{1}{4}''$.

There are six edges to the three-sided scale, Fig. 5. Turn the scale to the edge that is divided into regular inches and the inches are divided into quarters, eighths, and sixteenths of an inch. This is the regular 12″ rule and is used for measuring border lines, title blocks, etc., but not for measuring drawings to scale.

Now turn the scale to another edge and it will be noticed that there is a $\frac{1}{4}$ stamped at one end and a $\frac{1}{8}$ at the other end. This edge contains the $\frac{1}{4}''$ and the $\frac{1}{8}''$ reduced scale. Starting at the end marked $\frac{1}{4}$, find the 0. The next figure in the same horizontal line

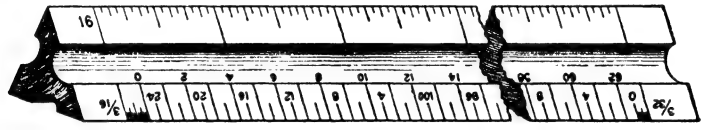


Fig. 5. Three-Sided Scale

of figures is 2, the next 4, 6, 8, etc., up to 46. By measuring with a ruler it will be found that the distances between 0 and 2, 2 and 4, 4 and 6, etc., are all exactly $\frac{1}{2}$ inch. Halfway between the 0 and 2, 2 and 4, etc., there is a vertical line which divides the distance between 0 and 2, 2 and 4, etc., all the way across the scale into quarter inches. The shorter vertical lines belong to another scale.

It is easily seen that the scale from the $\frac{1}{4}$ end has been divided into quarter inches, with every second quarter inch numbered, as 2, 4, 6, 8, 10, etc., up to 46, and that each one of these quarter inches represents 1 foot. Accordingly the distance between the 0 and 6 represents 6 feet and the distance between the 0 and the middle mark between 10 and 12 represents 11 feet. Thus in an actual foot on the quarter-inch scale there are 48 quarter inches, and a drawing made to this scale is really being made only $\frac{1}{48}$ of its actual size.

The quarter-inch scale has been used to reduce feet to quarter inches. Now let us see how this same scale is used to reduce inches to quarter inches. On the other side of the 0 there is a quarter inch

divided into twelve equal spaces. If a quarter inch on this scale represents 1 foot or 12 inches, then 1 inch will be represented by $\frac{1}{12}$ of a quarter inch. Therefore, each of the twelve equal spaces composing this quarter inch represents 1 inch. To draw a plan to the quarter-inch scale of an object whose longest side is 4 feet 11 inches, put the scale on the plate so that the $\frac{1}{4}$ edge touches the paper. Then start at the 0 and count off four quarter inches and make a mark on the plate at that point; and then again start at the 0 and count off eleven of the small equal spaces on the other side of the 0 and put down a mark at that point on the plate. Then

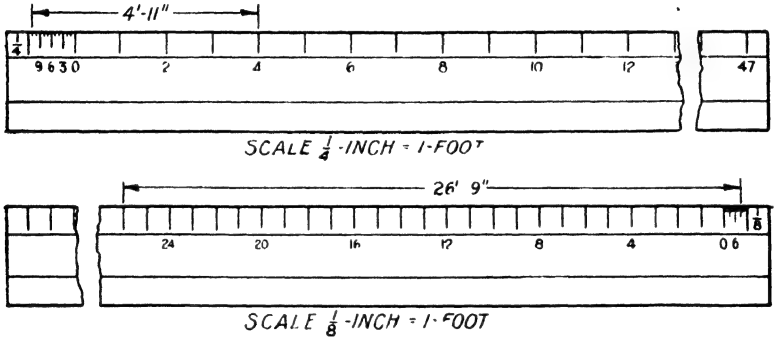


Fig. 6. ¼" Scale and ⅛" Scale

connecting the two marks on the plate, you have a line drawn to the quarter-inch scale which represents 4 feet 11 inches. This is shown in Fig. 6.

On some three-sided scales the $\frac{1}{4}$ is at the right-hand end and on others it is at the left-hand end, but the scale is used the same in either case. Fig. 6 shows how the quarter inch between the 0 and the $\frac{1}{4}$ is not only divided into spaces of twelve equal parts, each representing an inch; but it is also divided into four spaces, each representing 3 inches, and into two spaces, each representing 6 inches. Some scales differ slightly from this, but the principle is always the same; and the beginner can easily make the necessary calculation.

It is difficult to reduce fractions of inches to the quarter-inch scale. It is impossible to represent fractions of an inch other than $\frac{1}{2}$ inch on this scale. However, by using a very finely pointed pencil it would be possible to draw two parallel lines $\frac{1}{2}$ inch apart

according to the quarter-inch scale. On the scale $\frac{1}{2}$ inch is half of any one of the twelve equal spaces. The general practice in drafting is to disregard fractions entirely when laying out the distance between two points, using small scales. The written dimensions include the fractions, and the drawing is a fraction of an inch inaccurate; but as the written dimensions are the ones actually followed, no harm is done. Drawings should be kept accurate only down to the inch.

The $\frac{1}{8}$-inch scale is found on the same edge as the $\frac{1}{4}$-inch scale, but at the other end. Find the 0 near the $\frac{1}{8}$ end and note that the spaces toward the center of the scale are first divided into quarter inches, and then eighths. Each $\frac{1}{8}$-inch represents 1 foot, just like the quarter inch represents one foot on the quarter-inch scale. These eighth-inch divisions are numbered every fourth space. The numbers run 0, 4, 8, 12, 16, etc., up to 92. Thus, the distance between the 0 and 16 represents 16 feet, and the distance between the 0 and two spaces beyond the 32 represents 34 feet.

On the other side of the 0 there is $\frac{1}{8}$ inch divided into six equal spaces, each space representing 2 inches. An eighth of an inch is too small to divide into twelve equal spaces, because each space would then be narrower than a very fine pencil line. Therefore, in using the $\frac{1}{8}$-inch scale for distances less than 1 foot, it is necessary to be incorrect, unless the distance is in multiples of 2. It is impossible to show fractions of an inch, using this scale. Drawings are made accurate to the foot and accurate only as low as 2 inches, the written dimensions shown on the drawings giving the exact dimensions.

Suppose it is desired to draw a line 26′9″ long according to the $\frac{1}{8}$-inch scale. Start at the 0 and count off twenty-six of the eight-inch spaces, or go two spaces past the twenty-fourth division and make a mark. Then again start at the 0 and, going in the opposite direction, count off four of the small divisions and make a mark on the plate. Then connect the two marks and the line will be 26′9″ according to the $\frac{1}{8}$-inch scale. This is 1 inch inaccurate on the drawing. Note the 26′9″ measurement in Fig. 6.

Now turn the scale to the edge on which there is a 3 at one end and a $1\frac{1}{2}$ at the other end. On the end marked 3, the distance between the 0 and the 3 at the end is equal to 3 inches, or according

to the 3-inch scale is equal to 1 foot. In other words, 3 inches represents 1 foot. The 3-inch scale is used when it is necessary to draw details to a larger scale in order to show the smaller parts more accurately. The architect has to show cross sections of various details with their dimensions, so that carpenters, etc., will know how to construct the details.

Going back to the 0 again, it will be noted that between 0 and the figure 3 at the end of the scale, the distance is divided into twelve equal spaces $\frac{1}{4}$ inch wide. Each of these twelve spaces represents 1 inch. This is a large scale and therefore fractions can be shown on it a great deal better and more accurately. Notice that each one of the twelve equal spaces is divided into eight smaller spaces, each of which represents $\frac{1}{8}$ inch. Therefore, using the 3-inch scale, lines can be drawn as close as $\frac{1}{8}$ inch, but any fraction below this would be rather difficult to represent. To draw a line $2'10\frac{3}{8}''$ on the 3-inch scale, start at the 0 and, going toward the center of the scale, count off two of the 3-inch divisions and make a mark directly under the 2 on the paper. Then start at the 0 and, going in the other direction, count off ten of the 1-inch divisions and then from this tenth division count off three of the $\frac{1}{8}$-inch divisions and put a mark on the paper at this point. Connecting these two points will give a line $2'10\frac{3}{8}''$ long according to the 3-inch scale. The student should practice using the scale until he becomes skilled in its use and understands it perfectly.

All the other scales found on the regular three-sided scale are used in exactly the same way as has been explained for the $\frac{1}{4}$-inch, the $\frac{1}{8}$-inch, and the 3-inch scales. While they all differ in size, the general principles for their use are exactly the same; and the beginner should have no difficulty with them. After considerable practice with any of the scales, it will be found that their use becomes almost second nature and certainly as easy as using the common twelve-inch rule.

When all the dimensions are not shown on a complete drawing, it is necessary to use the three-sided scale in a slightly different way. A typical example will show how to use the scale for finding missing dimensions.

Supposing on a blueprint of a floor plan for a certain building that a window symbol is shown near one corner of the building but

no dimension is given for the exact position of this window. The first thing to do then is to determine to what scale the drawing was made. As a rule the scale is placed near the title of the drawing. If it is not given, it can easily be found by selecting some even foot dimension and trying one scale after another until the proper one is found. Let us assume that the quarter-inch scale was used in this case. As has already been learned from blueprint reading, a window is located by a dimension line running from its center line to a corner of the building.

To find the exact location of the window, the three-sided scale is taken and the 0 line of the quarter-inch scale is placed directly over the center line of the window, keeping the edge of the scale just about over the horizontal line of the wall on the blueprint. Next, note directly under the edge of the scale the point at which the exact corner of the building comes. The number of quarter inches can be counted from the 0 line to the corner of the building. If the corner of the building is directly under one of the quarter-inch division lines, it is a simple matter to count the number of quarter inches. If there are four quarter inches, then the center line of the window is 4′0″ from the corner of the building.

If the corner of the building happens to come some place between the fourth and fifth quarter-inch division line, the distance is over 4′. The next step is to move the scale so that the corner of the building is directly under the fourth quarter-inch division. This will move the 0 off the center line of the window. The center line will then be some place under the twelve equal spaces between 0 and the $\frac{1}{4}$.

Note which one of the twelve equally spaced division lines is nearest being over the center line and then, starting at the 0, count the spaces up to this point. If the number happens to be 5, then the center line of the window would be 4′5″ from the corner of the building. This process is known as scaling a drawing.

The floor plans, elevations, etc., which are shown in architectural texts, are known as reduced drawings. If it is wished to find a missing dimension on such a drawing, set the dividers equal to the distance sought and place them on the scale shown on the reduced drawing so that one point of the divider is at 0 and the other on the horizontal line on which is marked the regular division.

The procedure then is to count the number of feet or feet and inches as described for scaling, with the exception that in this case the dividers are moved, if necessary, instead of the scale. It is generally necessary to judge with the eye the approximate number of inches, because the full twelve inches will not always be shown in the scale on the drawing. If a large copy of one of these small drawings was being made to the same scale and by the above method, and it was found a certain distance was 8′6″, it would be necessary to lay out this distance on the large drawing, using the regular three-sided scale. Practice and careful study will help the beginner to become skilled in the use of the scale.

DRAWING TECHNIQUE

Paper. Generally white drawing paper is used for all architectural drawing although cream colored paper is acceptable. However, a good grade of paper should be used so that the work will show up well and so that erasing can be done successfully without ruining the surface of the paper. Using cheap paper is false economy, except for practice work. We recommend Whatman's cold-pressed drawing paper or a good grade of cream drawing paper. This paper can be purchased at all stationery stores. The 19-inch × 24-inch size of paper is the most suitable for architectural drawing and should be used, except when the drawings are exceptionally small.

Pencils. The 4H and 5H pencils are the two most generally used. They should be kept well sharpened at all times. At least $\frac{1}{4}$ inch of lead should be visible and this should be kept well sandpapered to insure the point being fine so it will make a firm and solid line rather than a ragged or uneven line. A soft pencil should never be used as it makes too large a line and allows the lead to be smeared over the plate, causing a very unpleasant appearance. It is advisable to use the 5H pencil for all line work and the 4H for lettering, arrow heads, etc.

Experienced draftsmen sometimes use 6H and 3H pencils, but these are not recommended for beginners as they are too hard and too soft, respectively. After the beginner has had some experience, he can probably use these pencils, but even then they are not necessary. With experienced draftsmen the choice of pencils is more or less a matter of taste.

Holding Pencil. Some beginners have a tendency to press down hard on their pencils when drawing lines or lettering. This tendency should be guarded against as its practice not only furrows the surface of the paper and makes poor lines, but it also robs the draftsman of the ability to letter freely. The pencil should be held lightly so that it does not put a furrow or track in the paper.

One way to overcome the habit of pressing too hard on pencils is to have the lead so long and well sandpapered that hard pressure would break it before a deep line could be made on the paper. This method is recommended for all beginners. Holding a pencil or pen tightly is another frequent mistake that beginners make and which should be overcome early. Its continued practice tires the hand very quickly, with the result that the lettering is shaky, the lines uneven, and the work in general poorly done. Holding a pen or pencil lightly allows a free and easy movement of the whole arm, which is necessary for steady lines and good lettering. Therefore, one should practice until he has acquired the ability to hold the pencil or pen properly.

Overlapping Lines. In architectural drawing much more freedom is allowed than in mechanical drawing. The result of this freedom, if not overdone, is that the finished drawings are artistic, have character, and are interesting. These points in addition to accuracy and clearness are necessary. Study the plan in Fig. 3 and note how lines, when meeting at right angles or nearly so, are overlapped a short distance. This feature, if practiced with care, adds considerable to a drawing and saves time. Care should be taken that the overlap is as uniform as possible and not very long. Lines can be overlapped anywhere on a drawing except in cases where doing so might interfere with clearness.

Symbols. The use of symbols and the part they play in a drawing has already been explained. A list of the various symbols will be found in Fig. 7. As a drawing is composed mostly of symbols, it is important that all the symbols be drawn accurately to scale in order to give a true picture of the floor plan. Kitchen cupboards, sinks, stairs, chimneys, walls, partitions, bath tubs, etc., are shown on floor plans, and although the shapes of their symbols are standard, the sizes are not standard, and care should be taken to see that the symbols on the drawing are drawn exactly to scale. Where like

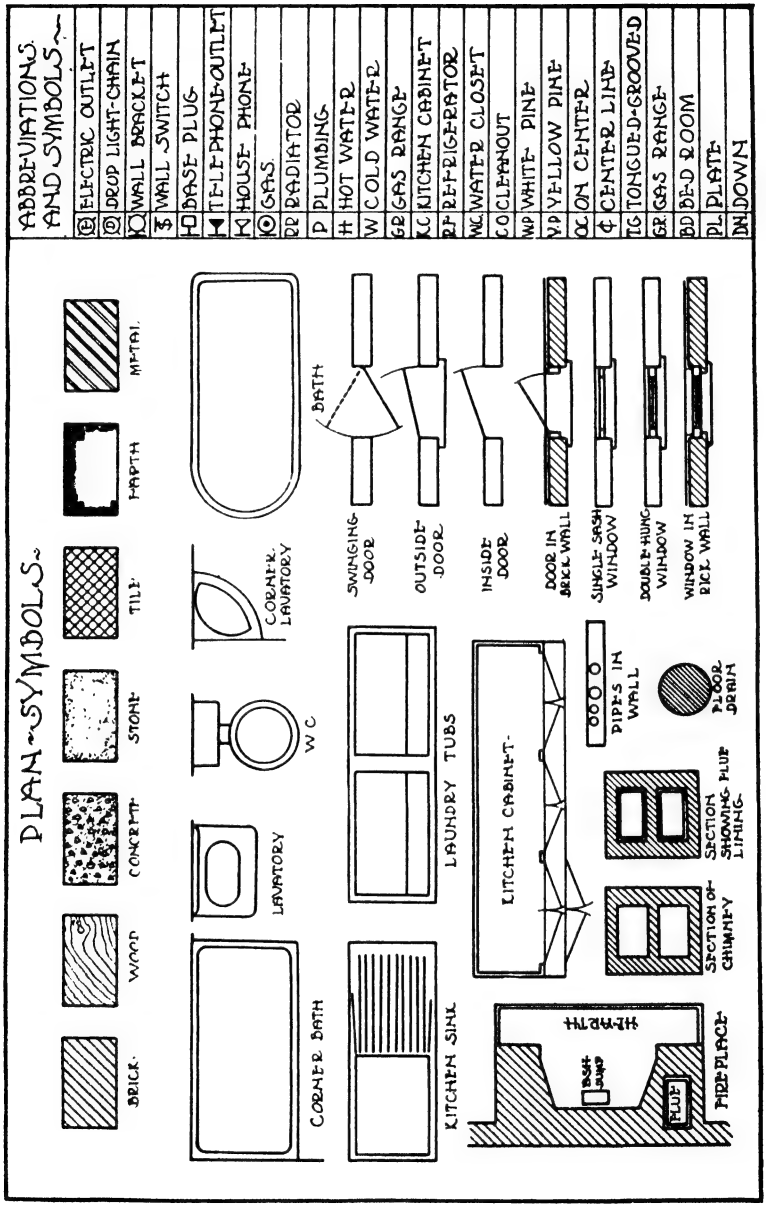


Fig. 7. Symbols and Conventions

symbols occur often on a drawing, they should all be exactly alike.

Some symbols, such as those for electric lights, switches, concrete, brick, plaster, rubber, stone, and earth, have standard symbols but the size of the various parts of each symbol depends on the judgment of the draftsman. Good judgment means that these symbols and their parts should be large enough to be perfectly clear and easily understood.

Electric light symbols are shown in Fig. 14. These circles should be $\frac{1}{4}$ inch in diameter and no larger. The four small lines intersecting these circles are at 45° to each other and are exactly

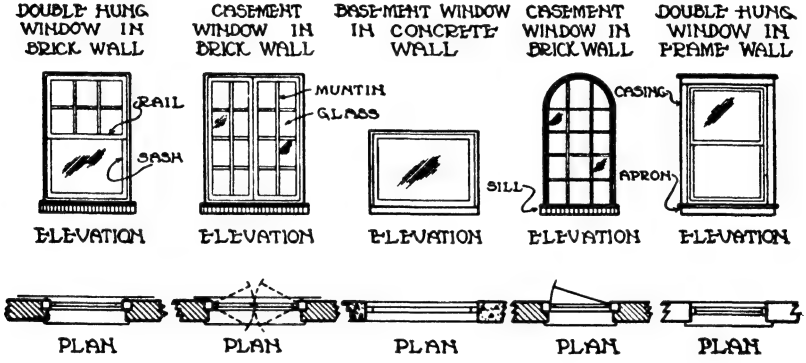


Fig. 8. Window Symbols

the same length. The circles used near the doors and windows should be $\frac{5}{16}$ inch in diameter. Window symbols have no definite dimensions but should conform in shape exactly to those shown in Fig. 8. It should always be kept in mind, however, that all symbols for objects such as sinks, chimneys, cupboards, etc., should scale exactly.

Accuracy. A working drawing is made to help builders to visualize the building and to give them all the necessary information for building, such as dimensions, shape, etc. Therefore it can readily be seen how necessary it is for drawings to be accurate. The drawing must not only scale accurately, but it also must be accurate in every single detail. While making a drawing, the dimensions should be frequently checked and when it is completed, a thorough checking should be done to be sure that there are no

errors. If the beginner forms the habit early of being accurate and checking his work carefully, he will have accomplished a great step forward. It should be remembered that a mistake on a drawing can cause a great loss in construction. A dollar spent in checking drawings saves ten in construction. Carelessness on the part of a draftsman will not be tolerated.

When making a large drawing from a smaller one, as the beginner is required to do, great care must be exercised constantly to prevent errors. Dimensions should be checked and rechecked.

It is also necessary to be accurate in drawing arcs to meet straight lines, rounded corners, etc. Beginners are often tempted to do these things free hand rather than go to the trouble of finding a center and using the compass as should be done. This form of inaccuracy does not necessarily make the drawing inaccurate, but it does detract greatly from the other essentials of a good drawing, such as beauty and character. It is hoped that all beginners will fully realize the necessity for accuracy even in the smallest details.

Fig. 9. Arrowheads

Arrowheads. Like lettering, the making of arrowheads requires skill which is only acquired by practice. Arrows are a small part of a drawing, but if they are poorly made a great deal of the desired effect of a drawing is taken away. Fig. 9 illustrates two approved arrowheads. At A is the open arrowhead, made with two strokes of the pencil or pen. It should be noted that the arrow is not composed of straight lines but that the two lines are curves, both being approximately the same. The extreme point should not be any heavier than the shaft line. The curved lines should be of the same thickness as the shaft. At B is shown the closed arrow. This arrow is first made similar to the open arrow with the exception that the lines do not curve quite as much and are not as long or as wide. The arrow is filled in, making it solid. Either type of arrow is acceptable, but the beginner should develop skill in making them by practicing on scrap paper.

Title Blocks and Borders. Every drawing in each set of plans should have a title block, containing information which aids in the filing of drawings, handling them, etc. In Fig. 14 is shown a typical title block. The information contained in a title block should include the following:

Owner's name and address
Architect's name and address
Type of building
Drawn by
Checked by
Sheet number

Sometimes more information such as date, revision dates, tracer, etc., is given, but on residence work this is not necessary. It will be noted that on all drawings of the proposed residence of Mr. G. B. Cox the titles are laid out similarly. This is a good practice and should be followed. The title block should always be in the lower right-hand corner, as shown in Fig. 14. Accuracy should be practiced in drawing it as well as the other parts of the drawing. On the average drawing, the title block should measure approximately $4'' \times 2\frac{3}{4}''$. The Block shown in Fig. 14 is recommended; remember that the whole drawing has been reduced to fit the page size.

Border lines give drawings a finished appearance that is pleasing to the eye and should always be used. They should be the heaviest lines on a drawing. Before starting a set of drawings, the size of plate should be determined and the same size used for all drawings. A set of drawings composed of different size plates is unhandy. Outside of the border lines there should be at least $\frac{1}{2}$ inch space all around except on the left-hand side where fully 2 inches should be allowed to facilitate binding the drawings together after the blueprints have been made.

Plate Titles. Each plate should have a title, such as "First Floor Plan" or "East Elevation." Sometimes, because of the varied information shown, a plate will have various titles.

Accompanying each title should be the scale to which that particular part of the drawing was drawn. It is also good practice to draw a scale as illustrated in various drawings for the G. B. Cox residence. If all dimensions are given, these scales are not necessary. The letters for the plate title should be the largest on each plate and can be underlined or not.

Size of Lettering. The lettering on drawings should vary in size not only to give contrast but also to show the relative importance of the various parts of the drawing. The largest lettering should be on the main title and on the average drawing the height of these letters should be approximately $\frac{3}{8}$ inch. The room titles are next in importance and these letters should be $\frac{1}{4}$ inch high. All other lettering, such as dimensions and specifications, should be $\frac{3}{16}$ inch high.

The lettering used in window and door schedules and the notes should be of two sizes. For the main titles, such as "Door Schedule" and "Notes," the letters should be $\frac{1}{4}$ inch high and the balance of the letters $\frac{3}{16}$ inch high. The large lettering in the title block should be approximately $\frac{5}{16}$ inch high and the small lettering $\frac{3}{16}$ inch or $\frac{1}{8}$ inch. These lettering heights vary according to taste, but the beginner is advised to use the heights as given here.

Wherever fractions occur, they should appear as they do in the various drawings for the G. B. Cox residence. It should be noted that fractions extend above and below the top and bottom guide lines. The amount of this extension depends on taste.

Cleanliness. No drawing will have the desired beauty or snap if it is soiled, no matter how well the line work and lettering have been done. A soiled drawing indicates either a careless draftsman or the use of improper pencils. If care is taken and the correct instruments are used, then the drawings will be clean when they reach completion.

T-squares, triangles, scales, and instruments become dirty when not in use if allowed to be around without being covered. They should be carefully put away after using and then dusted before using again. Between working periods, the drawing itself should be kept covered with a cloth or close-fitting clean paper.

Placing of Titles. The titles for plates, rooms, details, etc., should be placed where they will appear well, and, in the case of smaller details, they should be near enough to the details they name to prevent their being misleading. Sometimes a draftsman carelessly places the titles on a detail sheet, thus making it difficult to determine just what detail any particular title refers to.

Titles for rooms, etc., should not be crossed by other lines or lettering. In other words, they should be placed where they

will stand out clearly and, if possible, near the center of the area they refer to. Plate titles should be placed near the middle point of the plate so as to give balance to the drawing. Sometimes the main portion of a drawing is more to one side on a plate. In this case the title should be centered under this portion. A study of Fig. 3 will illustrate how unbalanced a drawing would appear if the title "Plan" were either to the left or to the right of its correct location.

DOOR AND WINDOW SYMBOLS

The sizes of symbols should be accurately drawn on plan and elevation views in order to give the correct impression as to layout

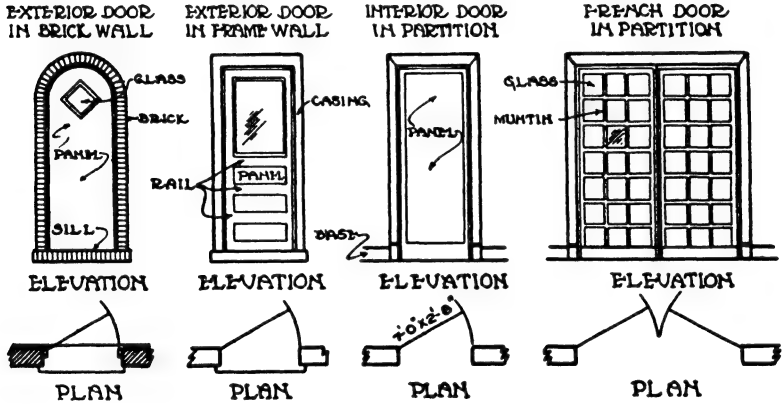


Fig. 10. Door Symbols

so as to aid the builder in his work. As the sizes of door and window symbols are more difficult to determine than other symbols, a careful study should be made of the following explanation.

The sizes of door and window frames are standard, for all mills make regular sizes and these sizes are the same at all mills. This is done to lower the cost of the frames and facilitate ordering and designing. Sometimes special frames are made, but this occurs only when odd-shaped door or window frames are desired. Architects generally try to keep within standard sizes, because the making of special sizes costs considerably more. When a 2′8″×7′6″ door is specified, it means that the door, and not the door opening, is that size. In other words, all standard door sizes pertain to the door itself and the opening has to be made to correspond with the

door. When a 2-light 30″×28″ window is specified, it means that the window is double hung and that each one of the two pieces of glass is 30″×28″ in size. Sometimes a window is specified six lights 10″×14″ and one light 30″×28″. This means that the top of the double-hung window contains six separate pieces of glass each 10″×14″, and that the bottom is one piece of glass 30″×28″. In the case of a casement window, the specification would be 16 lights 10″×14″. Study Fig. 8 for illustrations of the various types of windows and Fig. 10 for the various types of doors. Both figures show the standard symbols.

Door openings on plan views are made exactly the same size as the door, as it is understood that allowance must be made for opening and closing. Plate VII shows how the jamb is constructed, the opening being very little larger than the door; and that on an elevation view, the width of the casing plus the amount of the jamb that is visible must be added to the total symbol.

Window openings are difficult to determine because of the muntins, sash, sills, etc., into which the glass is fastened. Fig. 11 and Plate VIII show a double-hung window in both exterior and interior elevation. It is assumed that the six upper lights are each 10″×14″ and that the lower light is 30″×28″. For a frame house it is desirable to show the plan opening as the distance between the vertical 2″×4″ studs on either side of the window. Refer to Fig. 11 and study the section through J-J, which is a horizontal section through the window, muntins, sash, and frame. To find the total opening between the 2″×4″ studs in each jamb section, add the total glass width plus the muntin width plus sash plus pulley strips plus sash weight box.

Looking at the elevation view of the window, it is seen that there are three 10″×14″ pieces of glass along the line J-J. These pieces of glass are represented by R-R, T-T, and S-S in section J-J. Each glass is 10 inches wide. Study the muntins and sash and note the distance between the pieces of glass in the muntins and the distance the glass extends into the sash. Then by adding $5\frac{1}{8}+10+\frac{1}{4}+10+\frac{1}{4}+10+5\frac{1}{8}$, the total width of the opening can be found. This width can be shown on the plan symbols. Sometimes the distance X-X on section J-J is used on the plan symbols. Either one is correct and the choice lies with the draftsman.

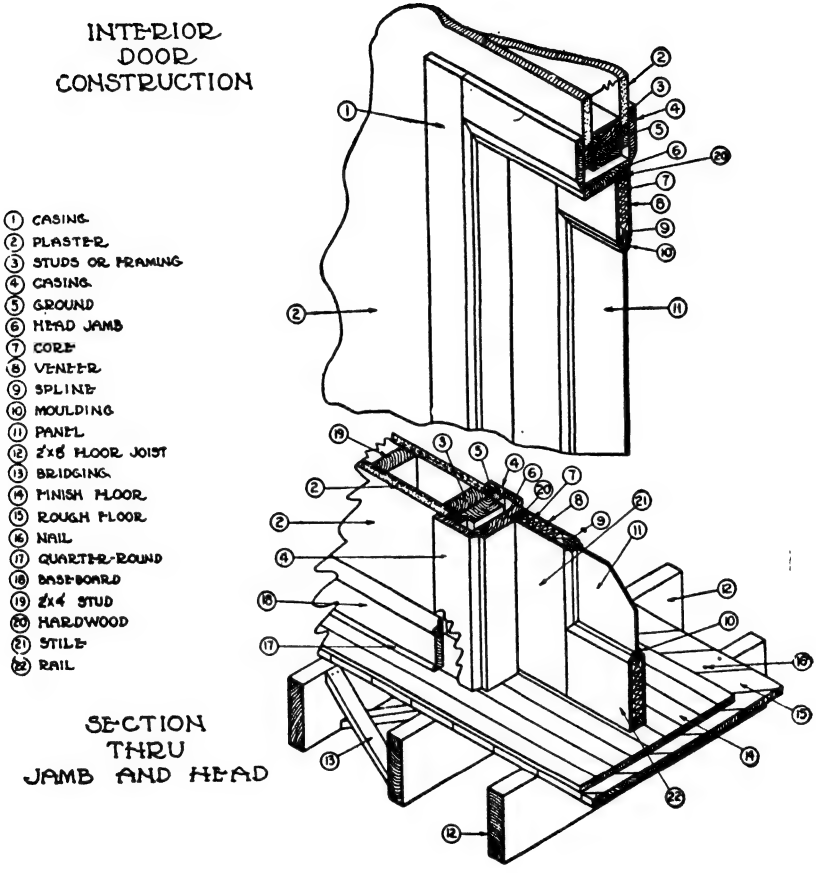


Plate VII. Isometric of Door

To determine the height of the opening for the window, much the same procedure is followed as for finding the width, using section H-H in Fig. 11. Much useful information can be secured from Fig. 11 and the beginner is advised to study it until he has a thorough understanding of it. Fig. 12 illustrates a vertical section through a casement window. Only one muntin is shown, but in such windows there may be several. Finding the total opening is done exactly the same as was explained for the double-hung window.

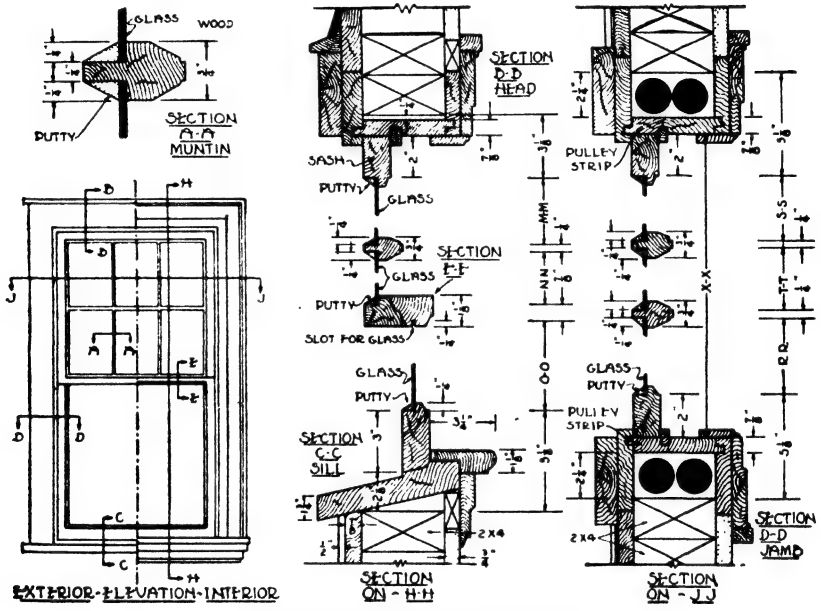


Fig. 11. Double-Hung Window Details

When calculating the width of the opening for a casement window, it must be remembered that no pulley box is necessary and that the piece corresponding to the pulley strip is up against the 2″×4″ on either side. The openings for windows in brick or tile walls are drawn slightly larger than the combined sizes of glass plus muntin plus sash. When constructing a brick wall, the window frames are set in position and the masonry built around them.

The openings for windows will be accurate enough if kept within one or two inches, as the main object is to keep everything on the drawing as near in proportion as possible. The beginner is urged to make a study of windows, doors, and frames in his own home.

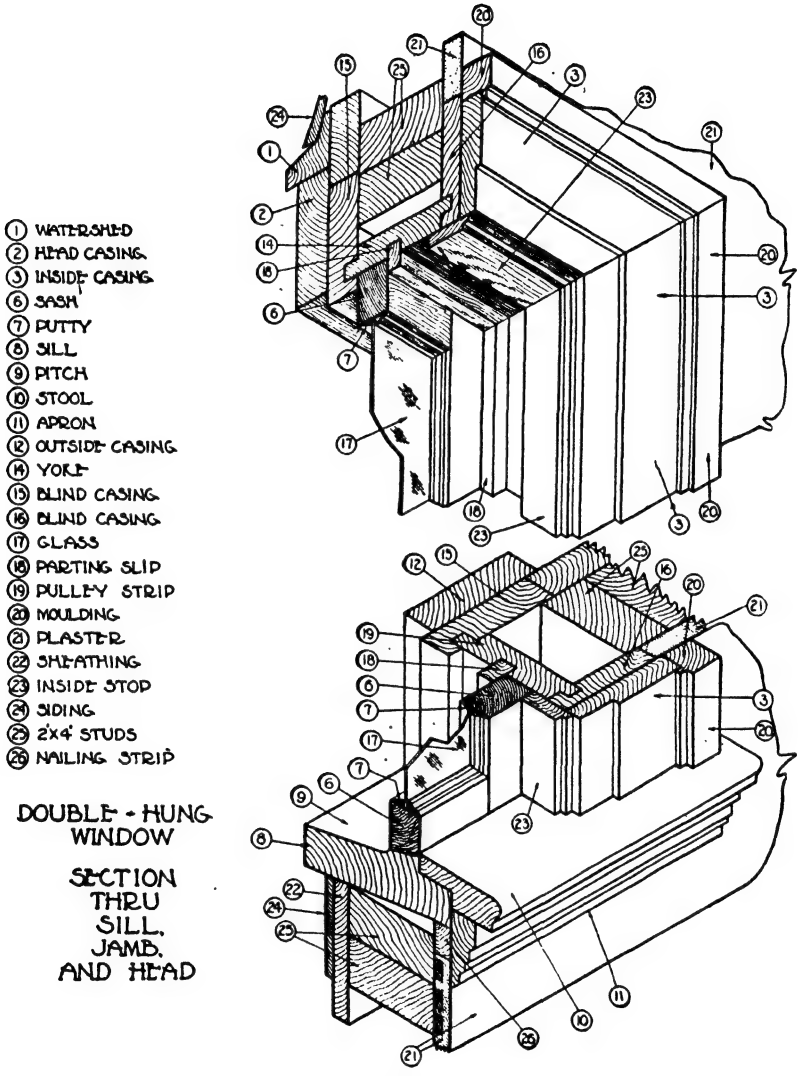


Plate VIII. Isometric View of Window in Fig. 11 Showing Section through Sill, Jamb, and Head

Trim Sizes. The casings for doors and windows and the trim, etc., for frame houses, vary in size in different houses. In this book, the size of the various trims are given on the examination drawings, but it is advisable that the various standard sizes of all lumber be secured from one or two lumber companies for use in the

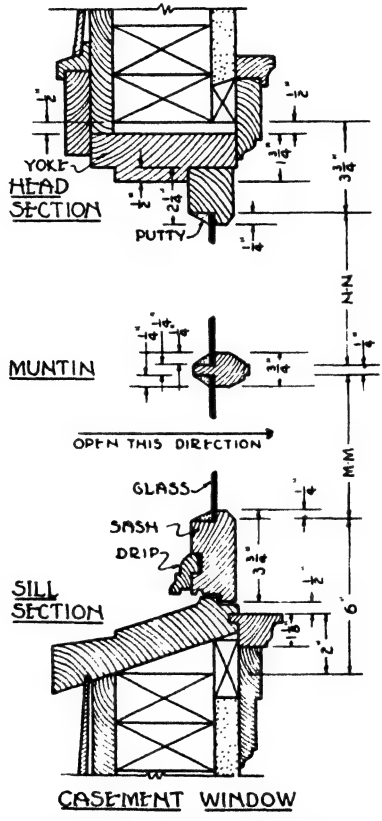


Fig. 12. Casement Window Details

more advanced design drawings. Mouldings of all shapes are also standard, and these sizes should also be secured for future use.

DRAWING FLOOR PLANS

Rough Sketches. Fig. 13 illustrates what is meant by rough sketches. Such sketches are made by the architect to illustrate his or some other person's idea as to the general style, shape, number of

rooms, etc., of a proposed new house. After these sketches have been agreed upon by all parties concerned, they are used as a basis for the actual working drawings.

Generally cross-section or coordinate paper is used for such sketches, because it is composed of small squares which are a help in drawing the sketches approximately to scale. The scale used depends on the size of the paper. Generally paper having $\frac{1}{8}$-inch squares is used and in this case each square represents one foot horizontally and vertically. A soft pencil is used and all the lines

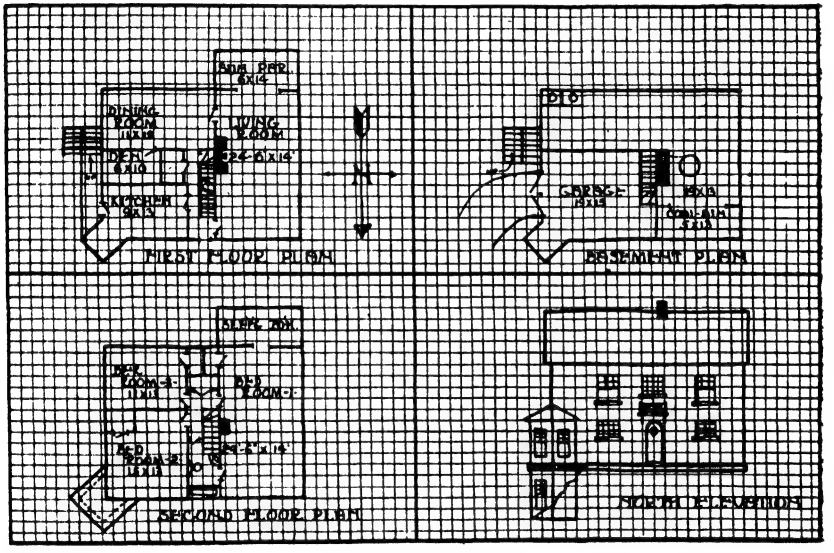


Fig. 13. Rough Sketch

are sketched in free-hand. The use of a soft pencil allows free use of an eraser, thus making it possible to change the sketch as many times as necessary until a sketch or plan is agreed upon. When the actually working drawings are being made, the main dimensions are taken, approximately, from the sketches.

Working Drawings. Working drawings should show all of the information needed to build the structure they represent. They are the Architect's written instructions to the builder and as such should be complete enough in every detail to enable the builder to carry on his job without having to stop and ask questions. Drawings should be accurate in every detail in order that the building

may progress steadily and without the expense of correcting errors caused by faulty plans.

In this lesson the beginner is required to copy certain drawings in order to acquire practice and skill in drawing technique, scaling, lettering, tracing, etc. There are perhaps many acceptable methods of laying out drawings, but the method explained in the following is recommended for the beginner as its continuous use will help him to develop speed and to maintain a high standard of accuracy. In the following, the making of working drawings is explained from two angles: First, the manner of copying existing drawings, such as is required to learn drafting technique; and second, the technique for actually creating working drawings, using only the rough sketches as the source for all information. Stress will be laid on the first method because, if it is thoroughly understood, the second method will be easy.

Drawing Floor Plans. To illustrate this first method, Fig. 14 is used, and the making of a reproduction of it is explained in detail. First of all, the size of the plate must be determined. The plate should be large enough to allow ample room for the drawing plus dimensions, title, title block, notes, and window and door schedules; however, too much room would not be desirable as the plate would then be too large for ease in handling and also too uneconomical. Studying the dimensions in Fig. 14, it is noted that the main portion of the plan is 28′4″ in depth, the front porch is approximately 5′ in depth, and the rear porch is approximately 3′. This totals approximately 36′0″, which equals 9″ using the $\frac{1}{4}''=1'$ scale. (This is also easily calculated as there are 4 quarter inches in each inch, and 36 divided by 4 equals 9.) To this 9″ must be added enough room for the dimensions and the title; it is estimated that $2\frac{3}{4}''$ will be ample, so the top and bottom border lines will be $11\frac{3}{4}''$ apart. Again studying Fig. 14, it is found that the main portion of the house is 31′6″ wide and that the chimney extends approximately 2′ more, making a total of about 33′0″, or about $8\frac{1}{2}''$, using the $\frac{1}{4}''=1'$ scale. The dimensions on the left will take about 2″ and those on the right about 2″ plus a small added distance, say 1″, between the notes and the dimensions. The notes column should be 3″ wide. A $16\frac{1}{2}''$ distance between the two side border lines seems about correct. Thus the plate border lines are $11\frac{3}{4}''\times16\frac{1}{2}''$, Fig. 15.

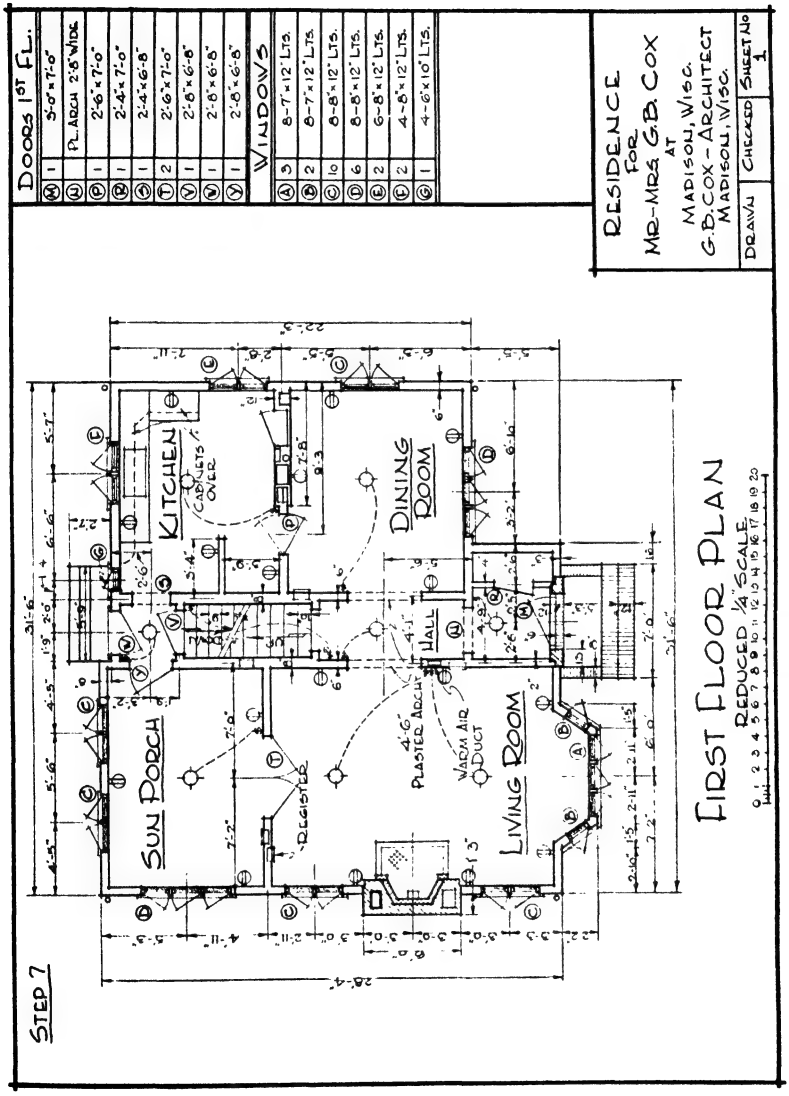


Fig. 14. Seventh Step—First Floor Plan

When determining the size of the plate to use for a drawing to be made from a rough sketch, the over-all size of the plan can be estimated by counting the squares on the coordinate paper and then assuming the amount of space needed for dimensions, notes, etc., Fig. 13.

Knowing the size of the plate, the first step can be completed as shown in Fig. 15. The border lines are drawn to the size determined upon; the title block is drawn 4″×2¾″ (the size recommended under the heading *Title Blocks and Borders*); and the notes column is made 3″ wide. It should be remembered that the border, title block, and notes column lines are the heaviest lines on any plate.

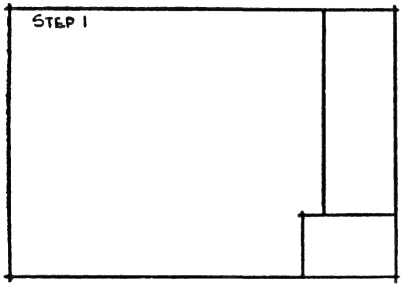


Fig. 15. First Step First Floor Plan

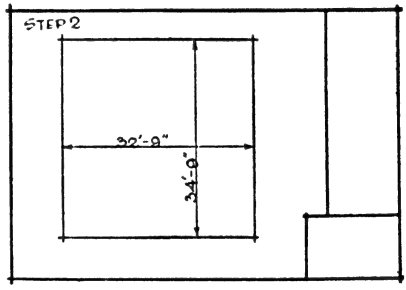


Fig. 16. Second Step—First Floor Plan

Fig. 16 illustrates the second step in the layout of a floor plan. In this step a rectangle is drawn which in size is exactly equal to the greatest over-all dimensions of the plan. This rectangle is placed on the plate so as to leave the necessary room for dimensions and is nearer the top border line, which gives balance to the plate and leaves room for the title underneath.

The total exact depth of the main part of the plan is 28′4″, as shown at the left in Fig. 14. The front porch extends out beyond the front part of the plan, a distance of 3″+3′3″+12″ or 4′6″. A 2′7″ dimension will be noted on the rear porch. However, half of the rear wall of the plan is set back 8″, so subtracting 8″ from 2′7″ leaves 1′11″, which is the distance that the rear porch extends beyond the 28′4″ dimensions. Adding 28′4″+4′6″+1′11″=34′9″, which is the depth of the rectangle. The width of the plan is 31′6″. But as the chimney extends 1′3″ beyond the outside edge of the left wall, the total width of the rectangle will be 32′9″.

The third step in the drawing is illustrated in Fig. 17. It shows the exact outline of the plan within the rectangle which was constructed in the second step. It also shows how this rectangle serves in locating the plan correctly on the plate and aids in drawing the outline and in keeping a higher standard of accuracy.

Using the dimensions given in Fig. 14, the front porch in Fig. 17 should be located first and then drawn. As there is no direct dimension locating the corner A of the porch with respect to the rectangle, some calculating must be done. From step 2 it is known that the horizontal line of the porch at A, Fig. 17, coincides with the lower line of the rectangle. Now we must find how far the point A is from the lower left-hand corner of the rectangle. In Fig. 14, the sum of the dimensions 7′2″, 6′0″, and 7′0″ gives nearly that distance; and, between the left end of the 7′2″ dimension and where the rectangle line would be, there is a space because of the chimney extending out 1′3″. Therefore, the distance between the lower left-hand corner of the rectangle and the point A is 7′2″+ 6′0″+7′0″+1′3″ or 21′5″ as shown in Fig. 17. The length of the porch is given, so the complete outline of it can now be drawn as shown in Fig. 17.

The outline of the chimney and that part of the plan outline between the chimney and the corner B, Fig. 17, should now be calculated and drawn. The position of the lower left-hand corner of the plan in Fig. 14, corresponding to point B in Fig. 17, is first determined. We have found that the outside edge of the horizontal wall is 4′6″ above the bottom line of the rectangle. The outside line of the vertical wall is shown in Fig. 14 to be 1′3″ to the right of the vertical outside edge of the chimney, and as this edge of the chimney coincides with the vertical line of the rectangle, the distance the corner B lies from the rectangle is 1′3″. The corner B, therefore, can be established by drawing the vertical and horizontal outside edges of the walls. From this corner there are three vertical dimensions, 3′3″, 3′0″, and 3′0″ in Fig. 14, which locate the center line of the chimney. The sum of these three dimensions, or 9′3″, equals the distance the center line of the chimney is from the corner B. The outline of the chimney can now be easily drawn.

The balance of the outline in Fig. 17, such as points C, D, E, F, and G, can be calculated and drawn the same as points A and B.

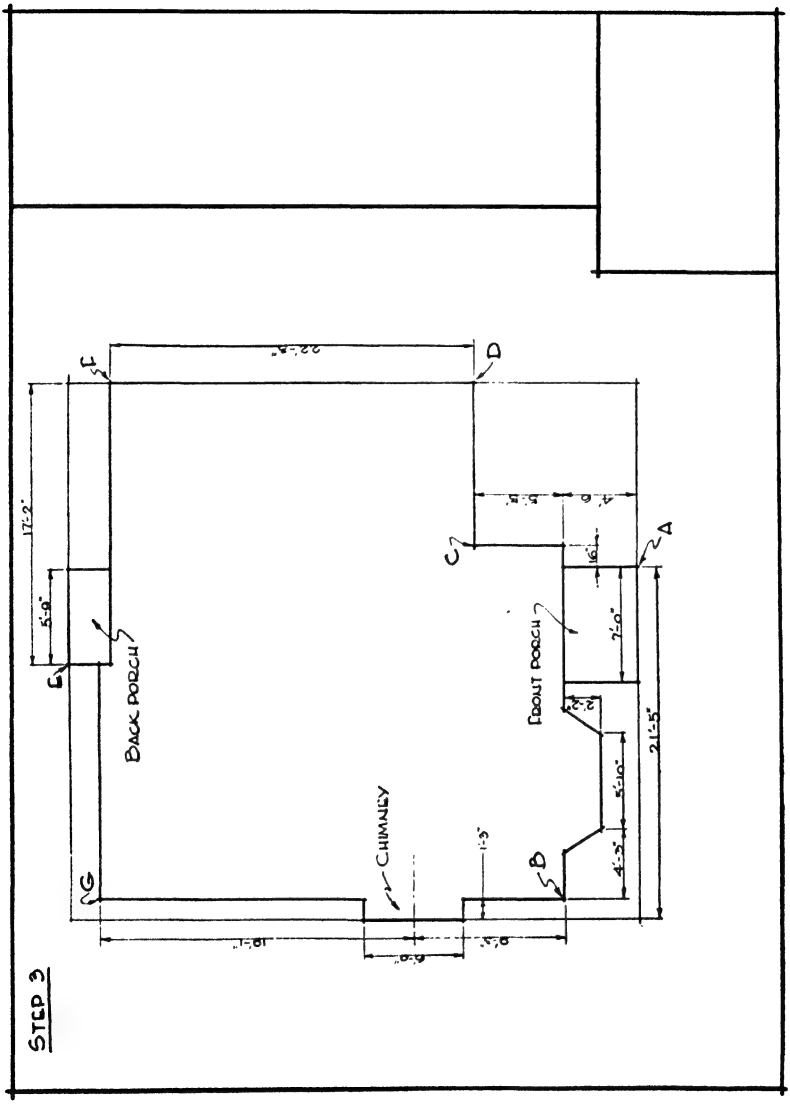


Fig. 17. Third Step: First Floor Plan

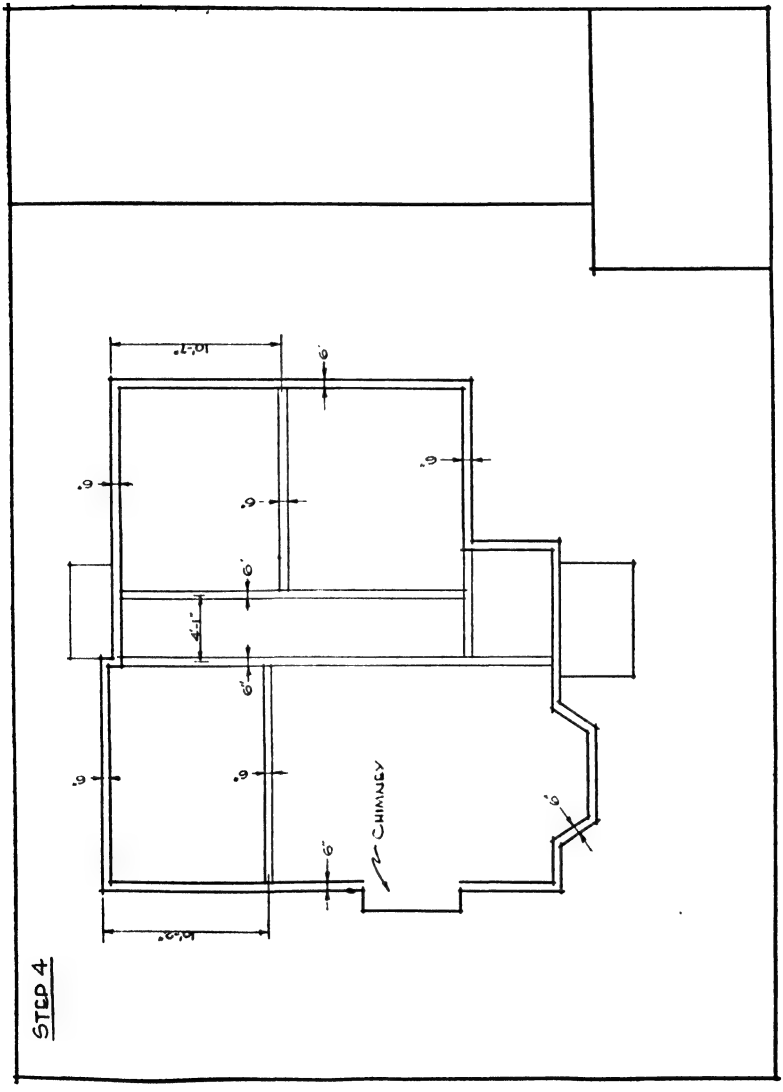


Fig. 18. Fourth Step—First Floor Plan

The beginner is urged to make sure that he can accurately locate these points by calculation before going further.

Step 4, Fig. 18, consists of drawing in the outside walls and the partitions. Fig. 14 shows that both the walls and the partitions (except the partitions on either side of the staircase) are 6″ in thickness. First, the outside walls should be drawn. Measure the necessary 6″ inward from the outline all the way around the outline and then at this distance draw the inside line which will complete the two parallel lines necessary for the wall symbol. The positions of the partitions on the inside must be determined accurately. Studying Fig. 14, it will be noted that the vertical partition forming the right-hand side of the sun porch and living room is a continuation of the jog in the outside wall near the back porch and can be drawn as shown in Fig. 18. The 8″ thickness shown in part of this wall need not be taken into consideration in this step. The center line of the other vertical partition is shown in Fig. 14 to be 4′1″ from the center line of the first one; the dimension giving this information is in the hall. The partitions between the sun porch and living room, the kitchen and dining room, and the one forming the entry way can all be easily calculated and drawn in like manner. It will be noted that no spaces for doors or windows have been left in this step. The rectangle can now be erased.

Step 5 is shown in Fig. 19. In this step we add the construction of windows and doors and a few dimensions and a few symbols. It should be stated at this time that the dimensions shown in Figs. 15, 16, 17, and 18 were only shown to help explain the various steps. However, the dimension lines and dimensions shown in Fig. 19 and the rest of the illustrations are actually part of the working drawing. (Detail drawings, which may be consulted for the more difficult constructions, are to be found in the Architectural Detailing section: front steps detail, page 99, 100 top folio; rear steps, page 101; partition between kitchen and dining room, page 107; fire place, page 127, balcony, page 131; etc.)

If the lines are drawn lightly in Steps 2, 3, and 4 there will be no trouble in erasing wherever necessary to show doors or windows. When drawing a window symbol, first locate its center line. The center line for the window on the right side of the dining

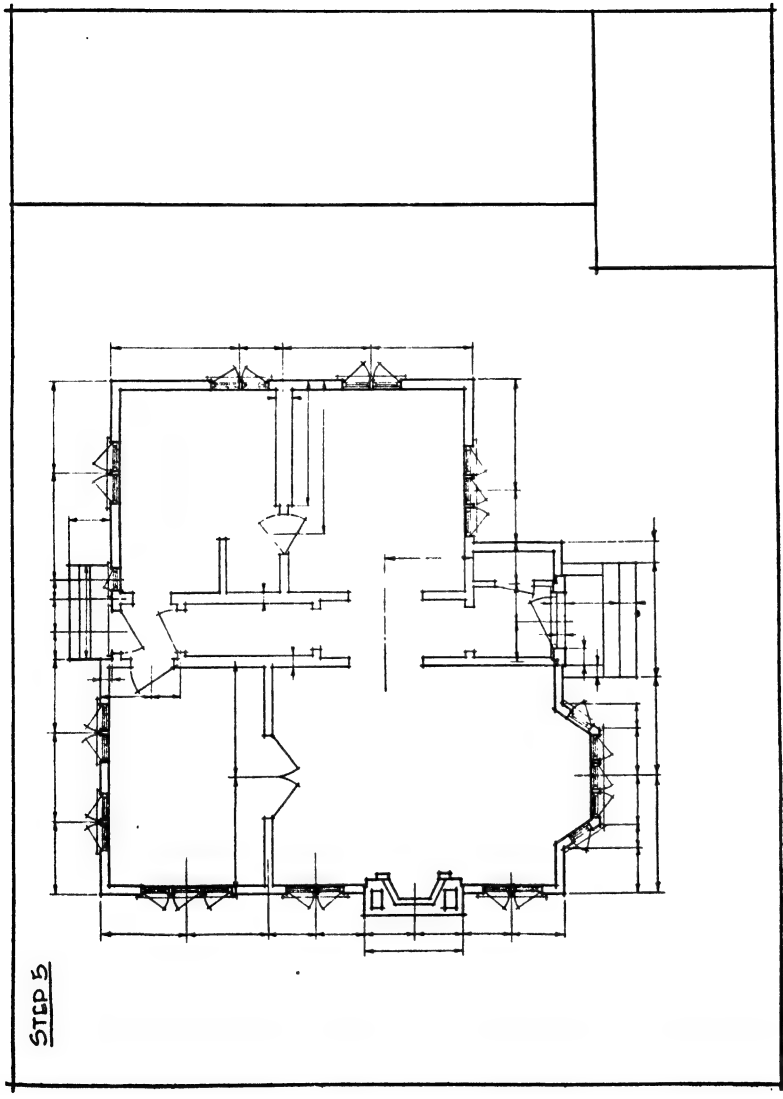


Fig. 19. Fifth Step—First Floor Plan

room, as shown in Fig. 14, is 6′3″ from the corner of the dining room. The letter C near the window refers to the window schedule in the column above the title block, wherein is given the information that this window is composed of eight lights each 8″×12″ in size. The figure 10 in the schedule means that there are ten windows on the first floor that same size. The width for the symbol can be calculated as already explained or simply copied by setting the dividers to the length of the symbol and then transferring the dividers to the reduced quarter-inch scale to determine the correct dimension. Various window symbols are shown in Fig. 8. It must be remembered that all the windows in this plan are casement. The method of locating door symbols is much the same as for windows and, as already explained, the door size given is the actual size of the opening in the wall. The sizes for all doors can be determined by referring to the door schedule in Fig. 14. For example, the front door in the plan has a letter M near it. Referring to the M in the door schedule, it is seen that the door is 3′0″ wide and 7′0″ high. The figure 1 means there is one door of that size on the plan. When the doors and windows are located and drawn in, the dimension lines and extension lines used in locating their center lines should be drawn in as shown in Fig. 19. However, the lettering should not be done in this step.

A part of the partition between the kitchen and dining room, shown in Fig. 14, is wider than the rest. In this step, such details can be drawn as shown in Fig. 19. The dimensions in Fig. 14 give the enlarged wall a thickness of 12″ and a length of 7′8″, including wall thickness. The light pencil lines on the drawing can now be erased and this partition redrawn according to Fig. 14. In like manner, the partitions on either side of the stairway can be redrawn. The steps on both porches are drawn, following the dimensions on Fig. 14. The second step on the front porch is not dimensioned, so its width must be determined. Set the dividers equal to the width and then without changing transfer them to the reduced quarter-inch scale on the drawing so that one point of the dividers is on the vertical line at 0 and the other point on the horizontal line to the right of zero. It will be found that the right point of the dividers is on the figure 1 which means the step

is 1′ or 12″ wide. The width of the back porch steps and other missing dimensions are found in like manner.

In the door and window symbols, the door lines are at about a 30° angle and the window lines at about 45° wherever possible. Keeping these lines at nearly the same angle over the entire plan adds uniformity to the drawing.

The dimensions for the fireplace and flues and the rubble columns on either side of the front door can be calculated by using the dividers and the reduced quarter-inch scale. Also, in places such as the arches between the hall and living room and between the hall and dining room, the width of the opening can be found by using the dividers. In some cases, for example the N opening leading into the hall, only the size of the opening will be given and not its exact location. This means that the opening is to be centered in the available wall space, which in this case is between the two hall partitions. Step 5 is complete as shown in Fig. 19.

If Step 5 were to be made from only a rough sketch, a great deal of design work would be involved such as the fireplace, door and window sizes, front and rear porches, the 12″ partition, etc. As architectural design is taken up in the more advanced material, it is sufficient here to say that once the design is made the actual drawing progresses in much the same manner as already explained. The main point for the beginner at this time is to learn the layout and technique of a drawing.

Step 6, Fig. 20, shows a more complete drawing, because of the addition of crosshatching and all the lines pertaining to the dimensions. The complete dimension lines are shown without lettering; these dimensions are taken directly from Fig. 14. The crosshatching in the fireplace and chimney symbol is composed of light lines drawn a little less than $\frac{1}{16}$″ apart and spaced uniformly and at a 45° angle. The crosshatching on the front porch represents bricks placed on side and is uniformly spaced to show the width of a 2″ brick reduced to the quarter-inch scale. These lines are made light.

Step 7 is the completed drawing shown in Fig. 14. This drawing was completed by adding size letters and circles for windows and doors, light symbols, switches, hot-air duct symbols, clothes

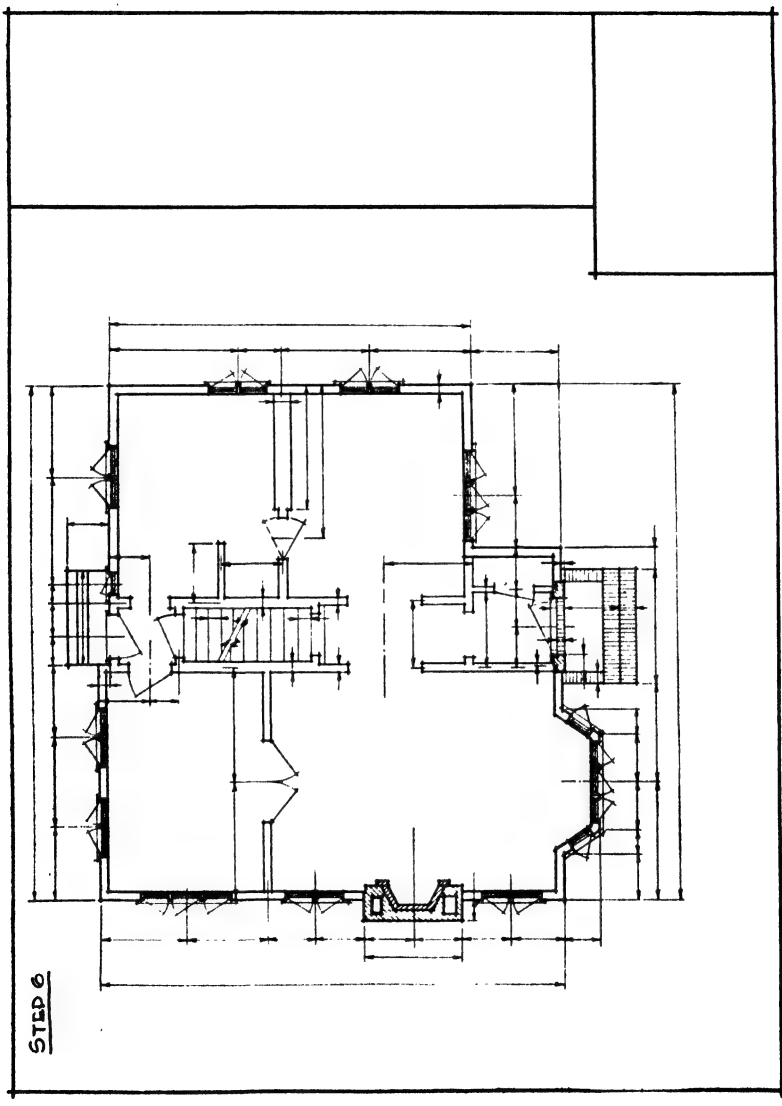


Fig. 20. Sixth Step—First Floor Plan

chute symbols, various kitchen symbols, all lettering, title, notes, title block, etc.

The sizes for lettering, window and door sizes, and electric symbols have already been explained. The sink, cupboards, registers, warm-air ducts, baseboard electric outlets, chutes, etc., can be calculated as to size and exact location by the use of dividers and the reduced scale. The circles in the door and window schedules are the same size as those on the plan. The horizontal division lines, etc., in the schedules can be calculated by use of dividers.

Much time should be spent in checking the completed drawing to see that every detail is as accurately drawn and placed as possible. The lettering, overlapping, arrowheads, etc., should be carefully looked at to see if any improvement can be made. A drawing cannot be checked in a short time, for you must check each dimension to insure its being accurate; and the various short dimensions to see that they equal the over-all long ones and that each dimension scales accurately. The habit of thoroughly and accurately checking pencil drawings is a big asset to the beginner. To fully complete a drawing, it should be cleaned with art gum or some other soft eraser, care being taken not to touch any of the lines. Not much erasing will be necessary on carefully made drawings.

All the floor plans must be completed in pencil before the elevations can be drawn, as the windows and doors are located on the elevations by the use of the plan dimensions. The floor plans should not be inked or traced until the elevations are complete and approved, because some location changes may be made on the plans.

DRAWING ELEVATIONS

The drawing of an elevation follows the same principles as the drawing of a floor plan. In the following explanation, Fig. 21 will be used, and the making of a reproduction of it will be explained in five steps; it is recommended that beginners and experienced draftsmen alike follow this procedure. The formation of the various steps for either plans or elevations may vary somewhat with different structures, but the principle is always the same.

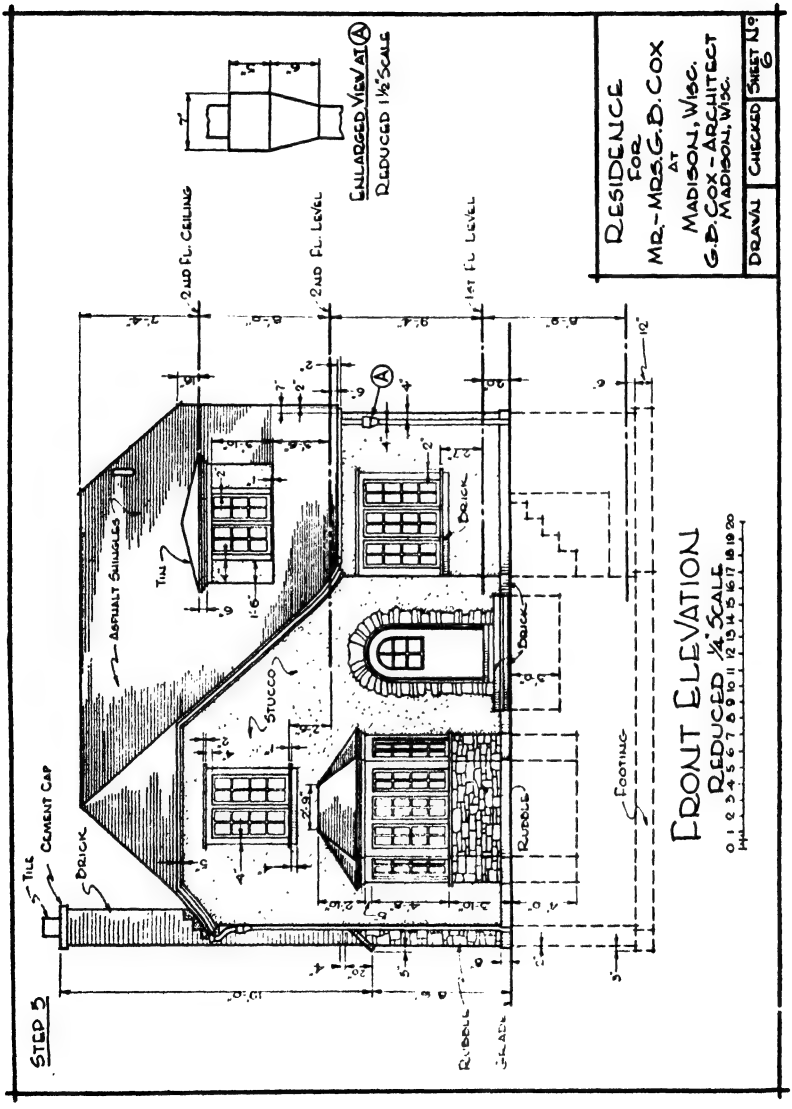


Fig. 21. Fifth Step—Front Elevation

The size of the plan is the first step to consider. The elevation may be a little wider than the plan to accommodate the eaves, etc., but not enough to cause trouble. On an elevation the same title block must be used as on a plan, but there are no notes or schedules on the average elevation drawing. If schedules must be put on an elevation the proper space can be allowed. It is desirable wherever possible to maintain the same size sheet for elevations as for plans in order to make handling and binding easier. The same width can be used for Fig. 21 as was used for Fig. 14 with no loss in space, due to the fact that certain details can be shown as in Fig. 25. The depth of the plate will have to be calculated. The vertical

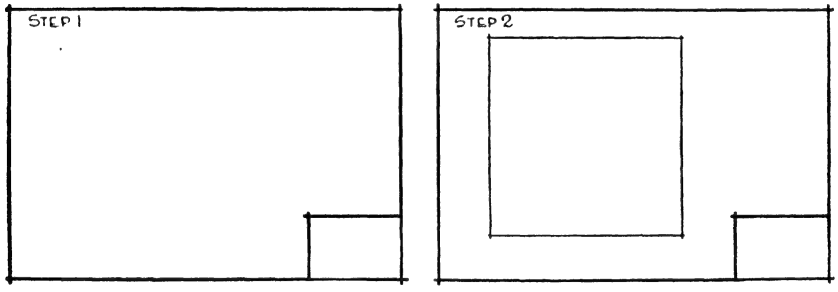


Fig. 22. First Step and Second Step—Front Elevation

dimensions are found at the right side of the elevation in Fig. 21. The total approximate height of the house is 12″+6″+8′9″+9′4″ +8′0″+7′4″. The top of the chimney extends about 2′ or 3′ above the 7′4″ dimension, making the approximate height about 37′0″, or 37 quarter inches on the $\frac{1}{4}'' = 1'$ scale. The total distance between the top and bottom border lines in Fig. 14 is $11\frac{3}{4}''$ (before reduction), or 47 quarter inches. Subtracting 37 from 47 leaves 10 quarter inches or $2\frac{1}{2}''$. So there will be plenty of room for the title under the drawing and a few dimensions if necessary. Therefore, the $11\frac{3}{4}'' \times 16\frac{1}{2}''$ plate size can be used for the elevations.

Step 1 and Step 2 are illustrated in Fig. 22. Step 1 is the same as Fig. 15 except the note column is omitted. Step 2 shows the rectangle, which is exactly equal in size to the over-all dimensions of the elevation in Fig. 21. It is located on the plate so as to leave room for dimensions and title, as was done for the plan in Fig. 16.

The horizontal dimensions of the rectangle will be the same as in Fig. 16 plus the amount that the footing on the left side extends beyond the wall and the amount the roof on the right side extends out beyond the footing and the outside edge of the wall. The vertical dimension of the rectangle is equal to the total distance from the bottom of the footing to the top of the chimney. From the bottom of the footing to the grade line, the distance is 12″+6″ +8′9″—20″, or 8′7″; these dimensions are shown at the lower right-hand corner of Fig. 21. The distance from the grade line to the top of the chimney cap is 8′6″+19′0″, or 27′6″; these dimensions are shown at the left. The distance from where the 19′0″ dimension stops to the top of the chimney is 12″. Therefore the total height of the house and the vertical dimension of the rectangle is 8′7″+ 27′6″+12″, or 37′1″. Fig. 23 shows the West Elevation.

Step 3, Fig. 24, illustrates the laying out of the main outline of the drawing just as was done for the floor plans. To do this, it will be necessary to use both Fig. 21 and Fig. 14. In Fig. 14 the projecting part of the front of the house is 7′2″+6′0″+7′0″+16″= 21′6″ in actual width; to this must be added the 1′3″ width of the chimney and the 3′2″ and 6′10″ dimensions; the total is the over-all house width at the grade level. The grade line must be established and drawn first. This grade line is 8′7″ above the bottom of the footing which coincides with the bottom line of the rectangle. The grade line is now drawn straight across the rectangle, extending beyond the vertical sides. From Fig. 21 it is seen that a row of bricks extends around the base of the house at the grade line. The dimension at the left in Fig. 21 shows these bricks to be 8″ high. Another line can now be drawn parallel to the grade line and 8″ above it which will show the top of the bricks.

In the lower left-hand corner of the front elevation, it is found that the footing extends 3″ beyond the outside edge of the foundation wall. The row of bricks along the grade line extends only 2″ so, to the right of the vertical rectangle line, leave 1″ space; then draw the vertical line forming the left end of the bricks. The left corner of the house is a distance of 1′3″+3″ from the vertical line of the rectangle as shown by the 1′3″ dimension under the chimney in Fig. 14 and the 3″ which the footing protrudes beyond the chimney in Fig. 21. A vertical line forming the corner of the house

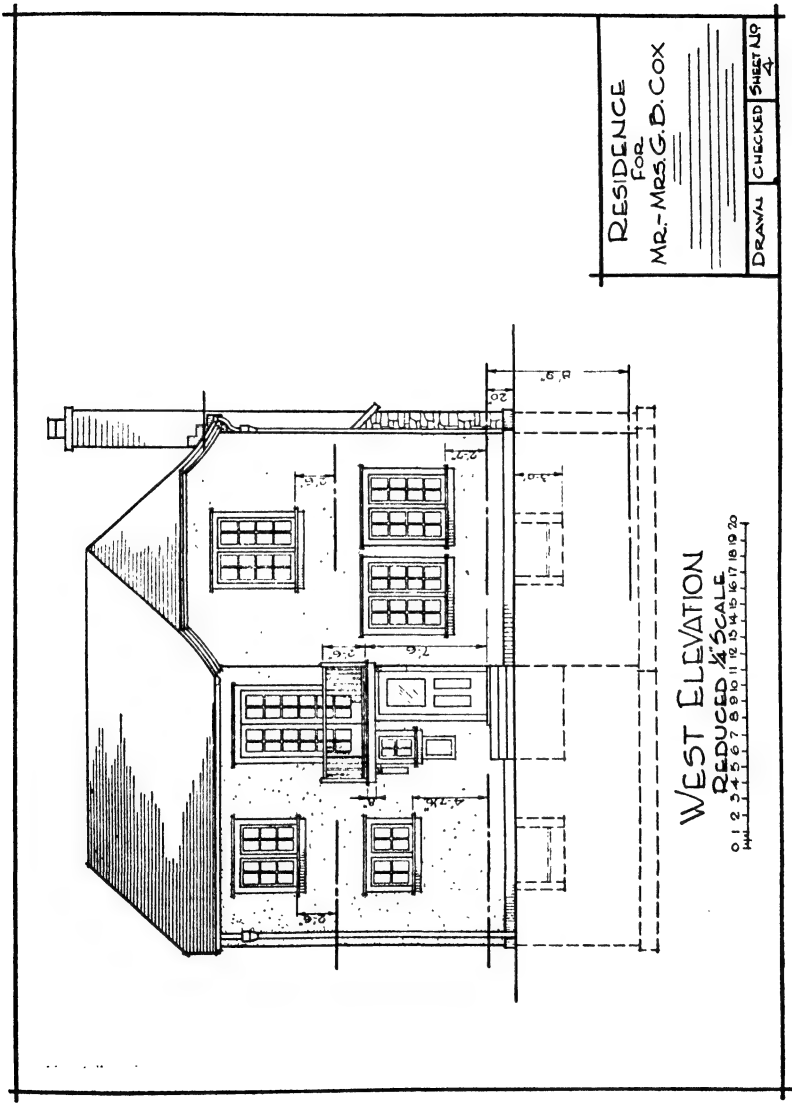


Fig. 23. West Elevation

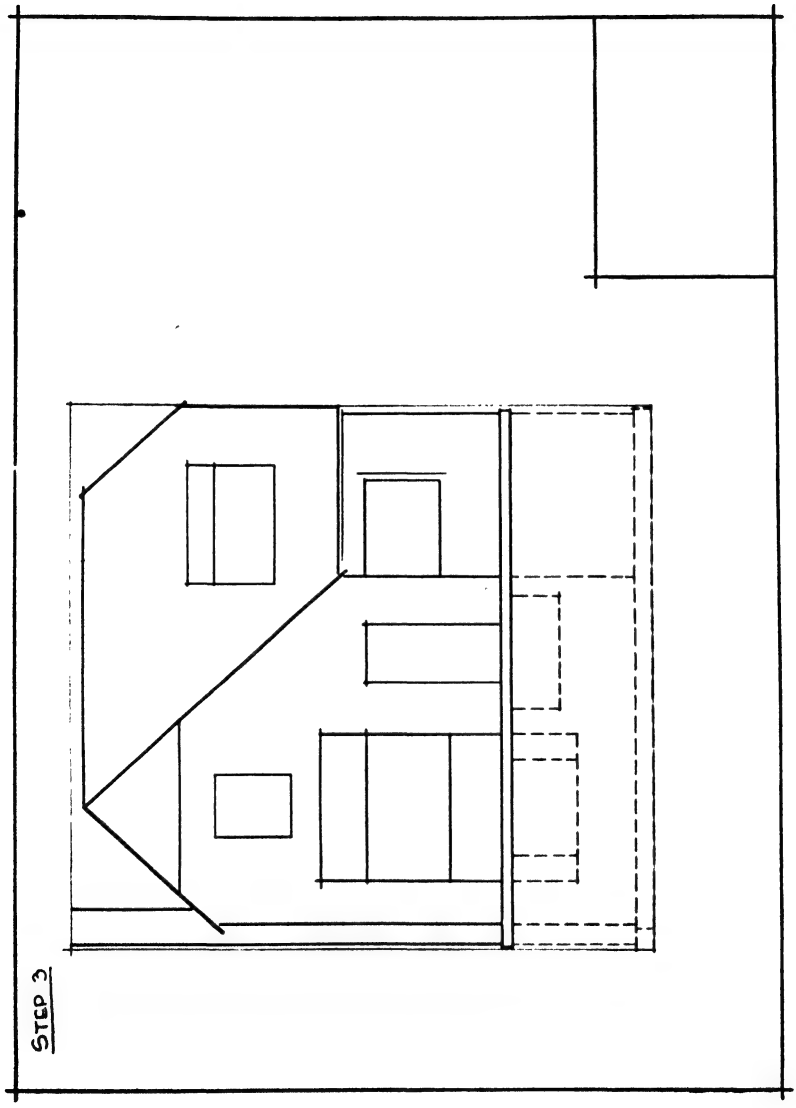


Fig. 24. Third Step—Front Elevation

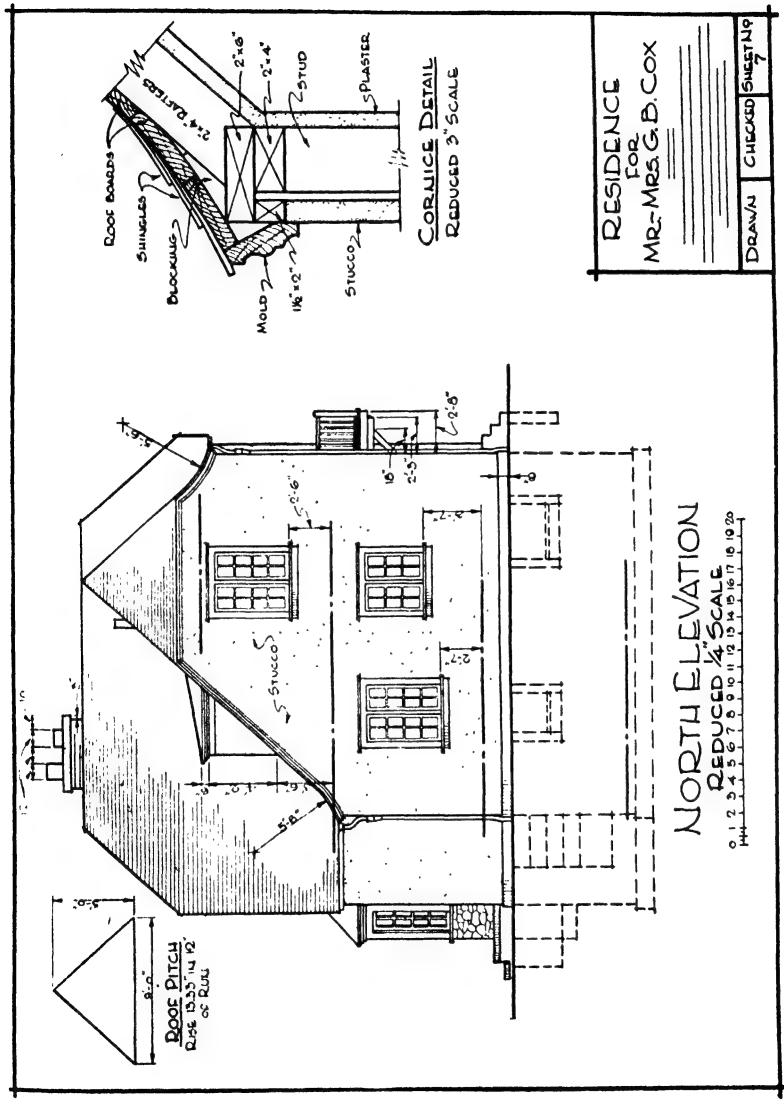


Fig. 25. North Elevation

can be drawn upward. Now from this corner measure to the right a distance of 21′6″ and then draw another vertical line. From this point measure again to the right a distance of 10′0″, as shown in Fig. 14, to locate and draw the right-side corner of the house.

The balance of step 3 is drawn in the same manner, using the dimensions in Figs. 14 and 21, and using the dividers to find the missing dimensions. The window widths and heights must be determined. The widths of all windows can be actually calculated or they can be copied from the plan in Fig. 14, keeping in mind that the 4″ trim on either side is added width. Fig. 12 can be used in calculating the heights if it is remembered that the height of the various lights must be substituted for M-M and N-N, and that the windows in Fig. 21 have more lights than shown in Fig. 12, and that additional muntins must be taken into consideration. It will be noticed that in Fig. 21 there is a molding above the dormer, above the front living room windows, and around the cornice. This molding is shown in cornice detail in Fig. 25. Such a molding is generally represented as in Fig. 21. The width is shown. The width of the front door given in Fig. 14 is used in drawing the elevation, keeping in mind that the 4″ trim on either side is added.

Step 4, Fig. 26, illustrates the more complete drawing. The rectangle has been erased, windows completed, chimney completed except for material symbols, front door drawn to actual form, and the various moldings put in.

The fifth and final step, Fig. 21, shows the completed elevation. The brick symbols, stucco symbol, rubble symbol, lettering, and all dimensions are shown to complete the drawing. There are more dimensions shown in Fig. 21 than usually are shown on an elevation. This was done to help the beginner in making the various calculations.

Shingle symbols are made with a very light line, the spacing generally being about 4″ on the $\frac{1}{4}''=1'$ scale. The brick symbols, shown on the chimney, under windows, and at the base of the house, are also made very lightly and spaced about 2″ apart according to the $\frac{1}{4}''=1'$ scale. The spacing for all such symbols should be uniform. The rubble symbols are made of medium weight lines, as shown in Fig. 27. Stucco symbols are made with dots. The concrete symbol is shown in Fig. 27. The heights of the letters are as

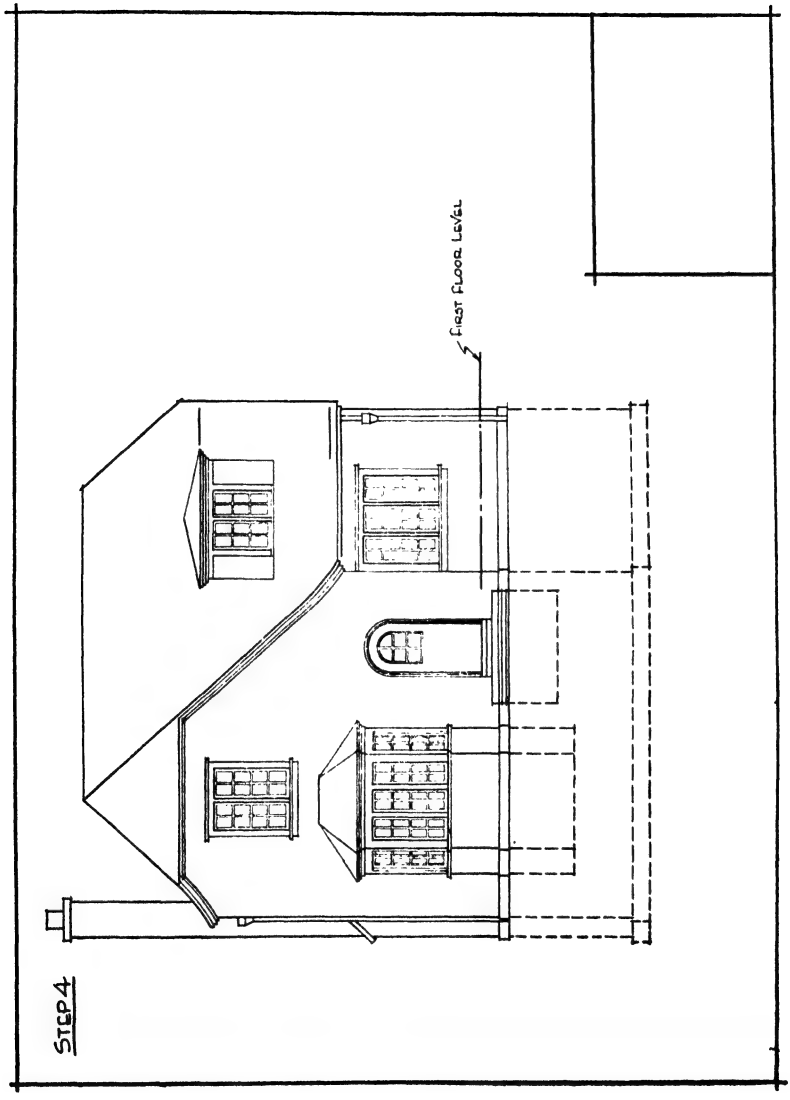


Fig. 26. Fourth Step Front Elevation

explained. The drawing should be checked very carefully in order to insure accuracy in all details and in the scaling of dimensions. All pencil drawings, even though they are to be traced, should be complete in every detail before the tracing is started. More experienced draftsmen sometimes leave out considerable pencil work, but this is very poor policy for a beginner. If the beginner will start

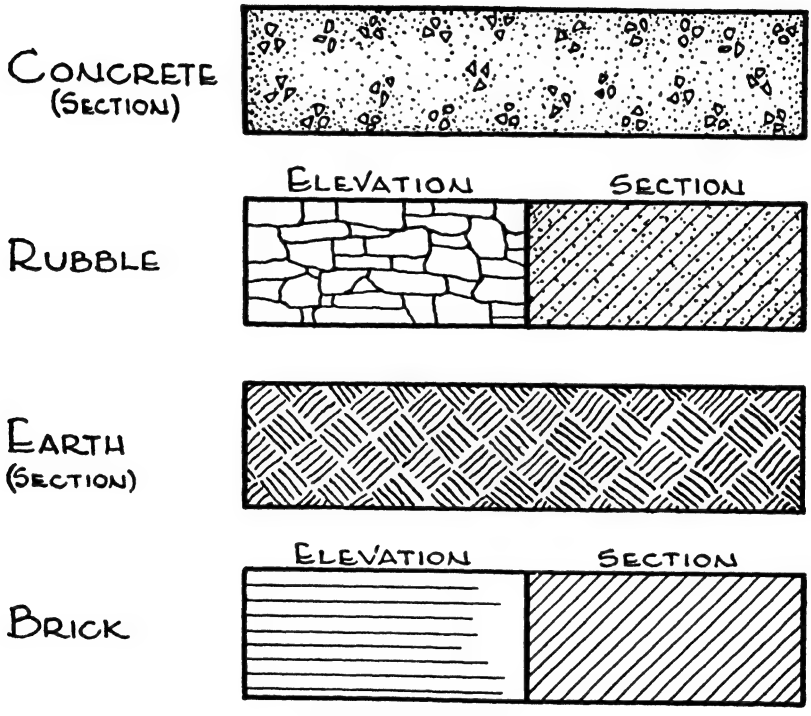


Fig. 27. Material Symbols

out by doing his work as recommended, he will find his drafting improving rapidly and he will not have formed the habit of being careless or inaccurate.

After such pencil drawings as Figs. 14 and 21 are complete, it is a good idea to go over the main lines, such as corners, roof lines, window and door outlines, and chimney outlines, making them a little heavier. This will give the drawing added beauty. If the guide lines for all lettering are made lightly, they will not injure the appearance of the drawing in the least.

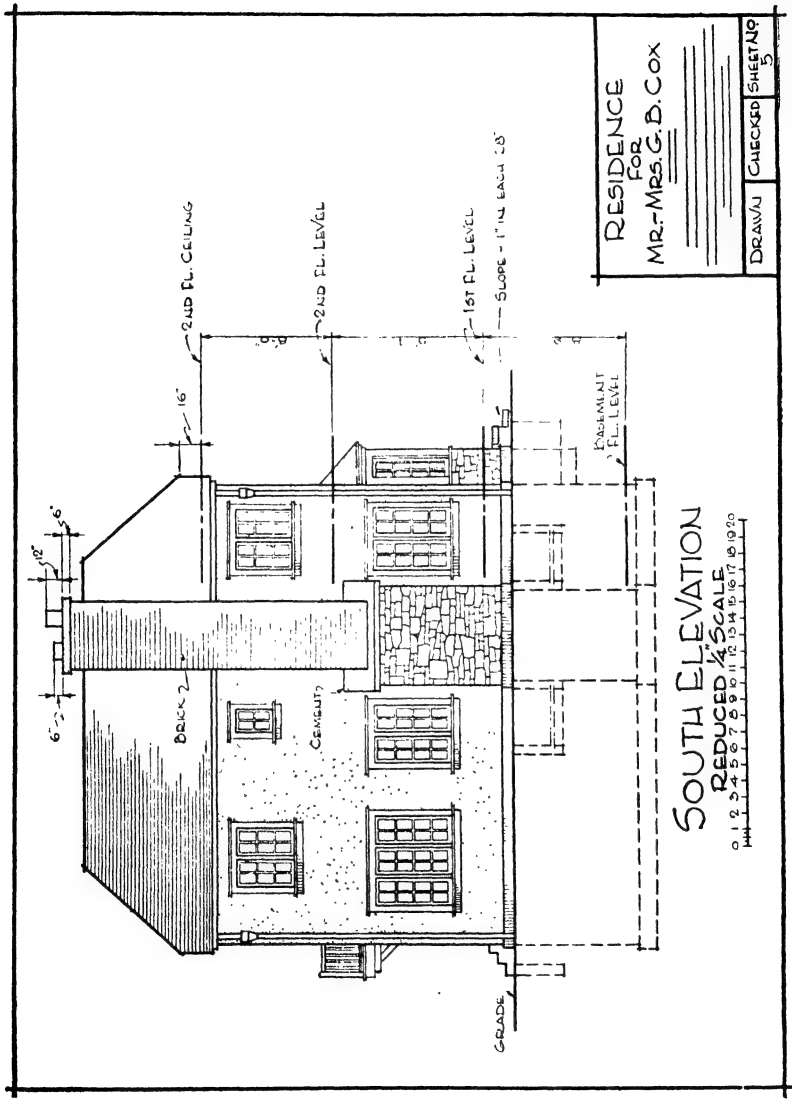


Fig. 28. South Elevation

All other elevations such as Fig. 28, are drawn in the same way. Basement plans and other floor plans, Figs. 29 and 30, are drawn the same as the first floor plan, Fig. 14. Note in Fig. 29 that the outlines for the front and rear steps foundations have been omitted, since details (in the Detailing section) give necessary dimensions.

Drawing Details. Detail drawings are shown starting with Fig. 41, in the advanced part of this book, and continue to Fig. 59. The purpose of such drawings is to show more clearly the dimensions and construction of parts of a structure. A detail should be drawn in steps, too.

Details can be drawn on floor plans or elevation drawings, where space permits, besides being drawn on separate sheets. The usual practice is to fill all available space on other drawings before starting new sheets as this saves excess sheets and makes the drawings more handy to use. Detail sheets should be of the same size as floor plan or elevation sheets.

The title block is necessary on a detailed sheet. The detail drawings in this text, however, have no title blocks because they are used as text material. Columns for notes can be used if required. When certain portions of a detail are exactly the same over a considerable distance, some of the detail can be cut out as shown in the three-sided scale in Fig. 5, in order to conserve on space.

When starting to draw a detail plate, care must be taken to place the various details so nothing will cross or interfere with them and so they will be clear. This can be done by making a rectangle equal in size to the over-all size of each detail. These rectangles can be shifted about until the best location for each is found. Dimensions used in finding over-all sizes for details must be found on plan and elevation drawings as well as the details themselves. Details may be shortened so as to keep them within reasonable bounds. For example, details have been drawn on some of the elevation plates in the Cox Residence in order to conserve space.

Be sure to keep the number of drawings down to a minimum, and make it possible to read the drawings without having to look through a large number of plates. These details can be planned as to size and location as explained for other details. When starting to draw a detail, it is advisable to build it up in much the same way as it would be in the actual construction.

Concrete, earth, rubble and brick symbols are shown in Fig. 27.

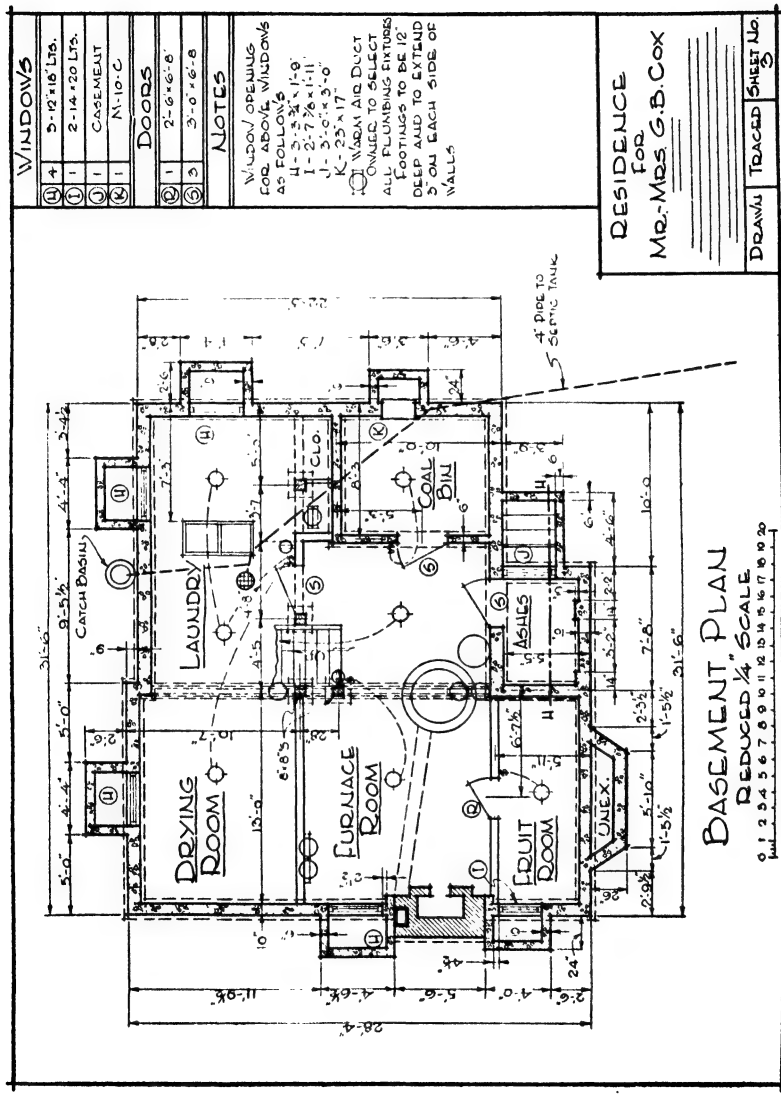


Fig. 29. Basement Plan

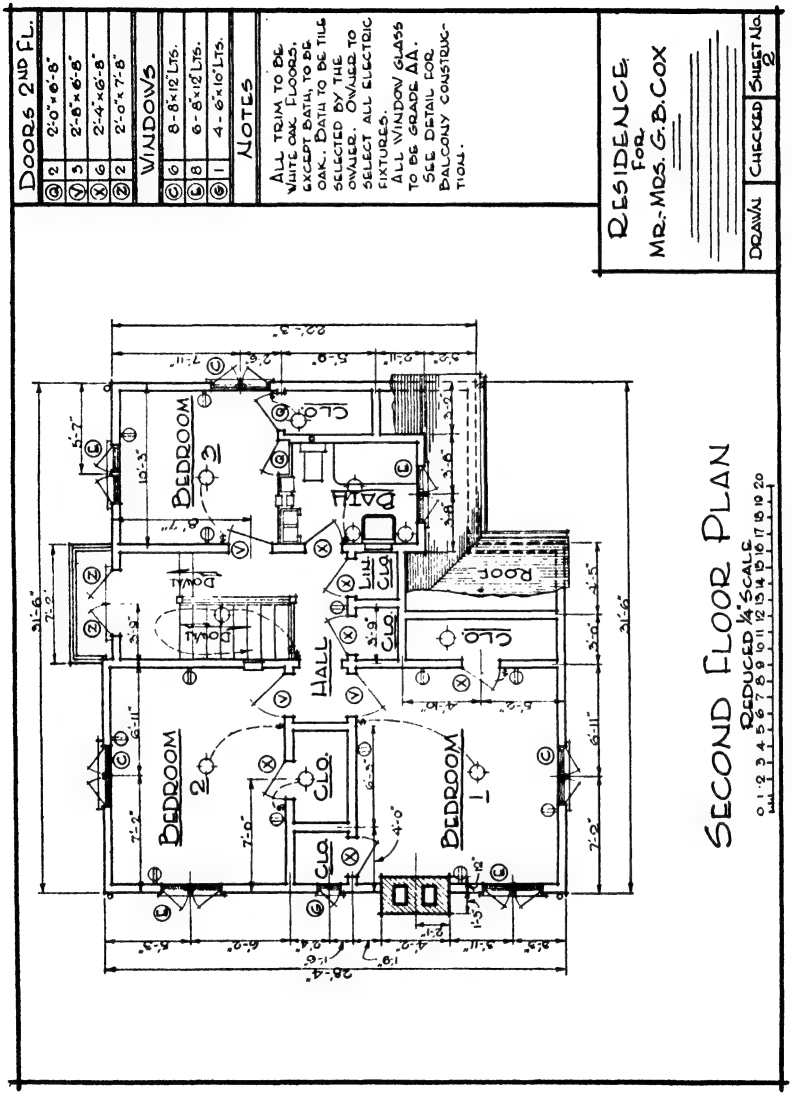


Fig. 30. Second Floor Plan

The stucco symbol is illustrated on the elevation views, and the wood symbol is made by drawing light wavy lines not less than $\frac{1}{16}$ inch apart or more than $\frac{1}{8}$ inch. These wavy lines should resemble the grain in the cross section of wood. It would be advisable for the beginner to note the grain of a 2″ x 4″ which has been saw cut at right angles to its length.

Advanced Drawing. As previously mentioned, the practice work on ordinary Architectural Drafting can be thought of and carried on from two angles. Up to this point one practice method has been outlined where the beginner is directed in copying a set of plans so that he can learn the various symbols and conventions and how to use them.

The second and more advanced method is to make working drawings from rough sketches upon which the rooms, halls, chimneys, dimensions, etc., have been designed roughly by the designer. Note Fig. 31. Here is a rough sketch for the first floor plan of the house shown in Figs. 32 to 38 inclusive. This rough sketch, made free-hand by a designer, can be an advanced step from such a sketch as Fig. 13. Generally, architects like the appearance of a sketch such as shown in Fig. 31 more than the one shown in Fig. 13.

The sketch, Fig. 31, is made fairly accurate as to scale and dimensions. Some lines or parts of the sketch may be off scale or some of the dimensions may not scale exactly right or something else may be inaccurate. But in any case, the draftsman is expected to correct any such irregularities as he makes up the regular working drawings.

In studying Fig. 31, it is noted that all walls and partitions are indicated by single lines. Doors are briefly indicated by their proper symbol together with their size. The same holds true for windows, fireplaces, chimneys, etc., which are merely indicated. Stairs, colonnades, closets, porches, terraces, etc., are also briefly indicated. There are too few dimensions for a regular working drawing.

When starting to draw a working drawing from a rough sketch, it is best to study what dimensions are given so as to know the over-all dimensions. The 36′0″ and 24′0″+3′6″ dimensions give the over-all size. The dimensions are assumed to measure to the outside of all walls; a rectangle to these dimensions can now be drawn. The outside walls can be measured and drawn, keeping in

mind that this is a frame structure which means 6-inch walls. By using the 14′6″ and 7′0″ dimensions, the partitions for the halls can be drawn, keeping in mind that dimensions extend to the outside edge of the outside walls and to the center lines of partitions. Dimension 13′9″ indicates where the partition between the dining room and kitchen will be. The dimensions 4′2″ and 6′8″ locate the rear kitchen window. The windows in the dining room, for example, are not dimensioned on the rough sketch so it is rightly

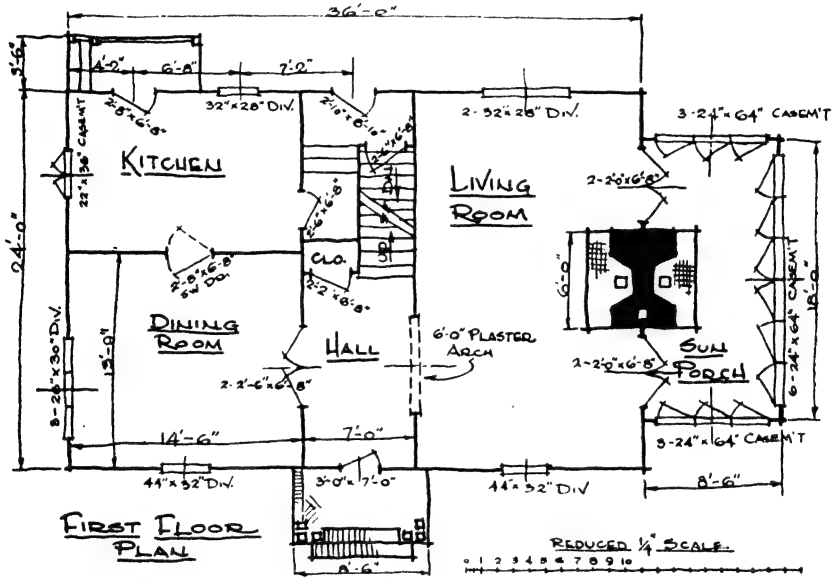


Fig. 31. Rough Sketch of a First Floor Plan of a Colonial House

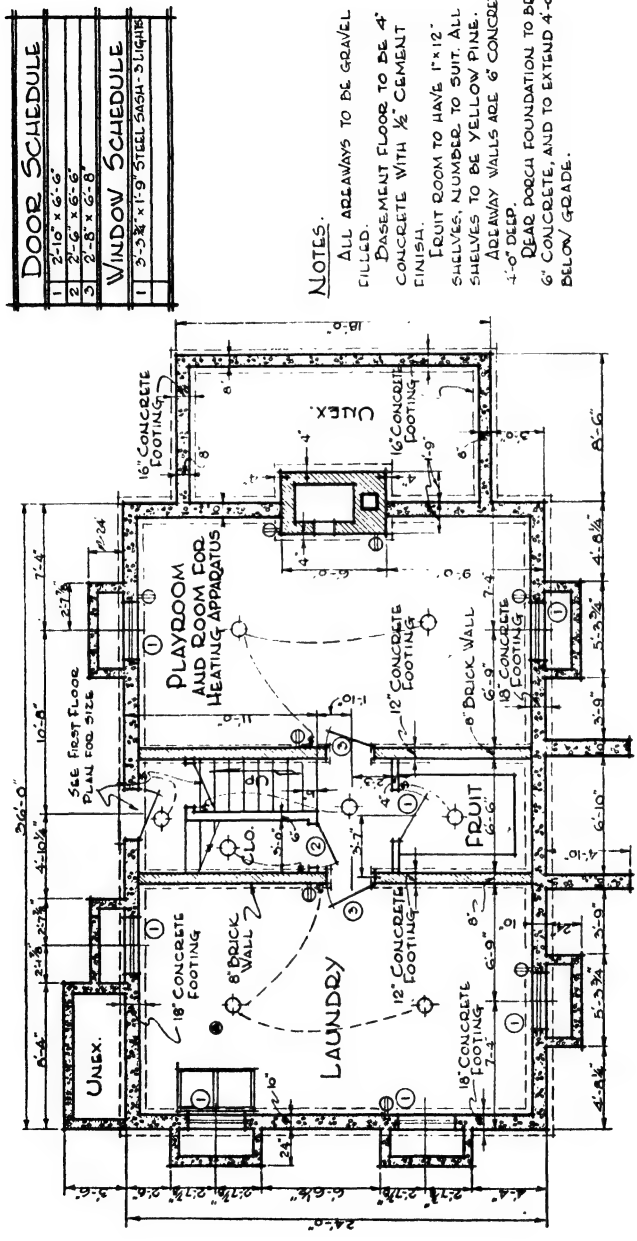
assumed that they are to be centered. The window sizes shown on the sketch indicate the exact window size to use.

In like manner, the balance of the working drawing is drawn by taking indications from the rough sketch. Electrical symbols are not always shown on a rough sketch so they will not be considered here. It is a simple matter, however, to draw in the proper symbols on a finished working drawing.

The drawing of elevations is carried on by either using sketches such as Fig. 13 or more advanced sketches on the order of Fig. 31. Types of cornice, roofs, doors, sidings, etc., are decided by the designer and given to the draftsman. The over-all dimensions are

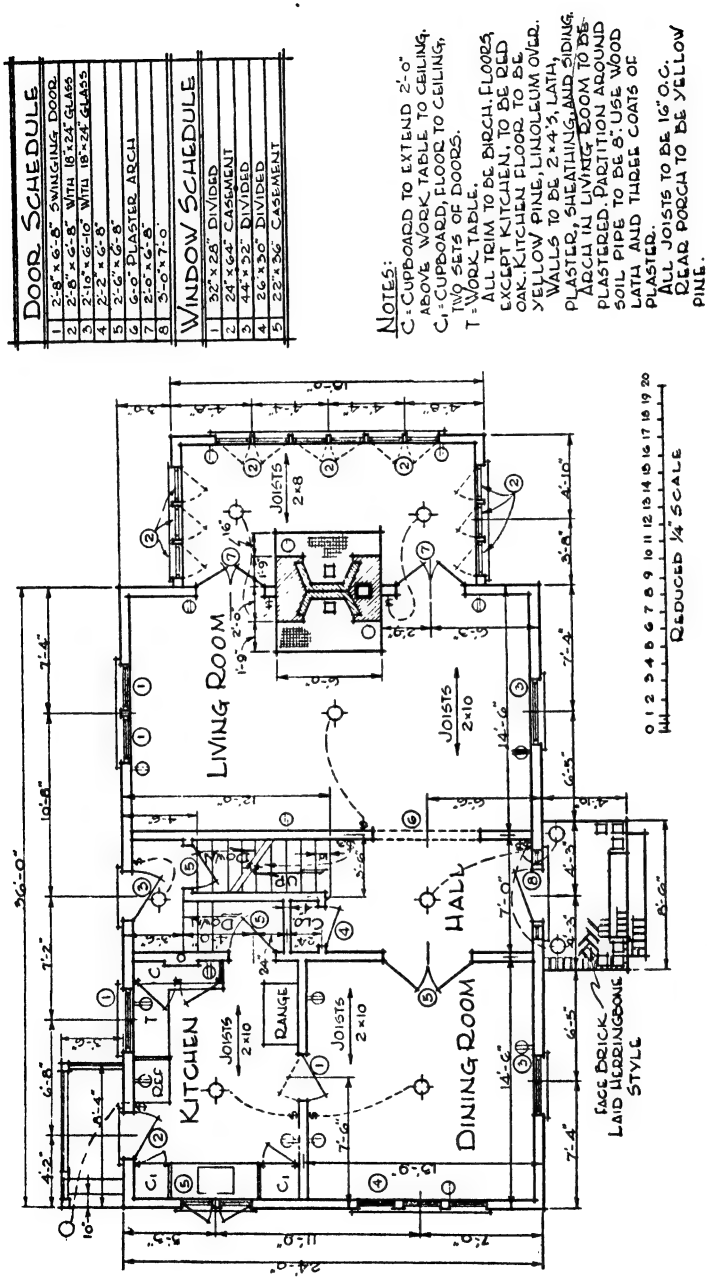
determined and vertical lines drawn representing the sides of the elevation. Roof, cornice, and such items, as mentioned above, are decided between draftsman and designer or designer and owner and drawn in accordingly.

It must be remembered that all working drawings must be thoroughly dimensioned and checked very carefully several times to insure their accuracy. Figs. 32 to 38 inclusive show working drawings for a typical Colonial Residence. The student should study them carefully noting how the various symbols, specifications, dimensioning, etc., are used. Special attention should be given to dimensions and general technique.



BASEMENT PLAN

Fig. 32. Colonial House—Basement Plan



FIRST FLOOR PLAN

Fig. 33. Colonial House—First Floor Plan

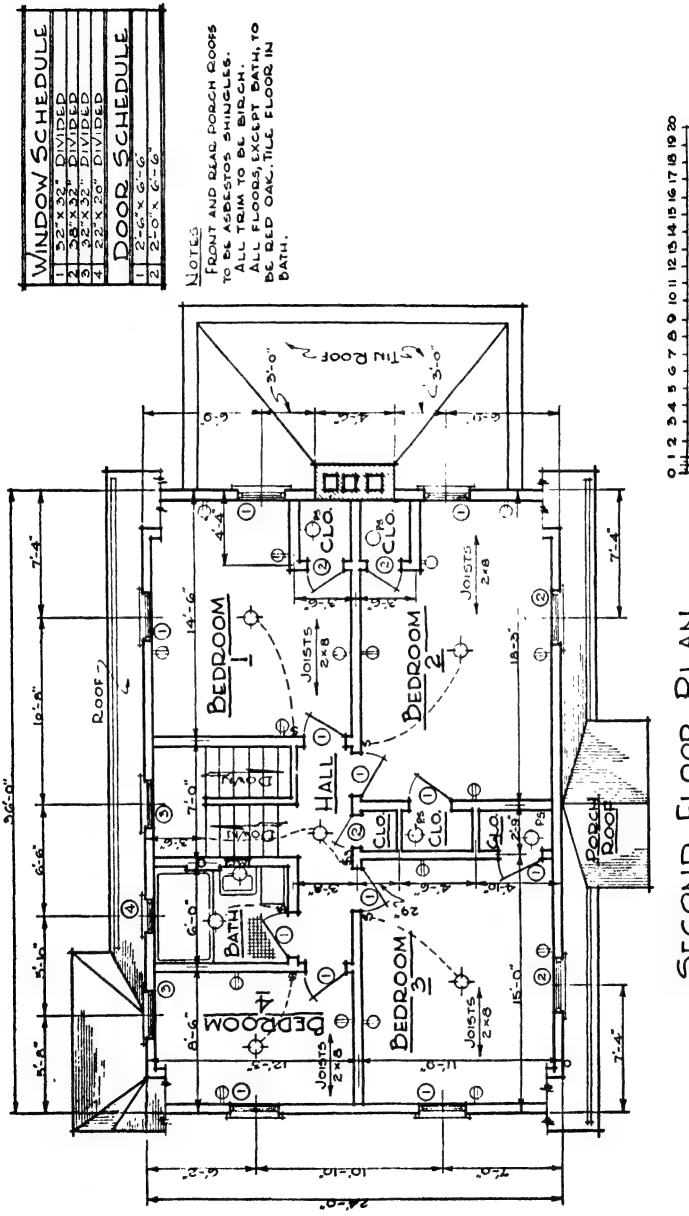


Fig. 34. Colonial House—Second Floor Plan

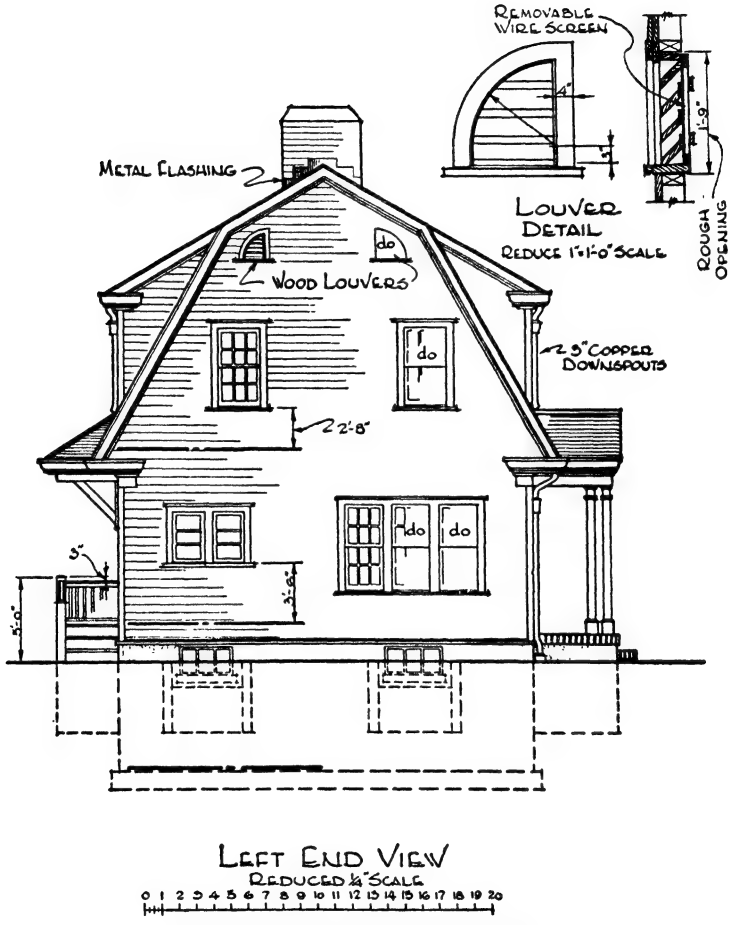


Fig. 35. Colonial House—Left Elevation

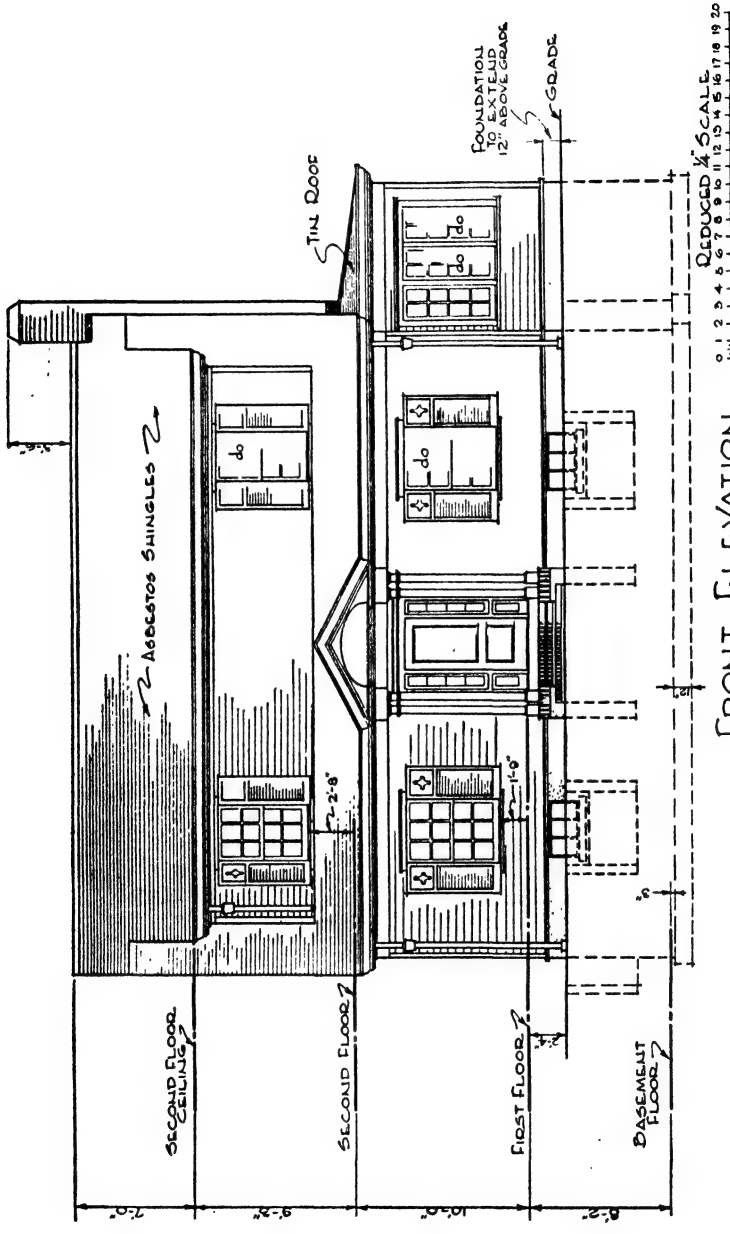


Fig. 36. Colonial House—Front Elevation

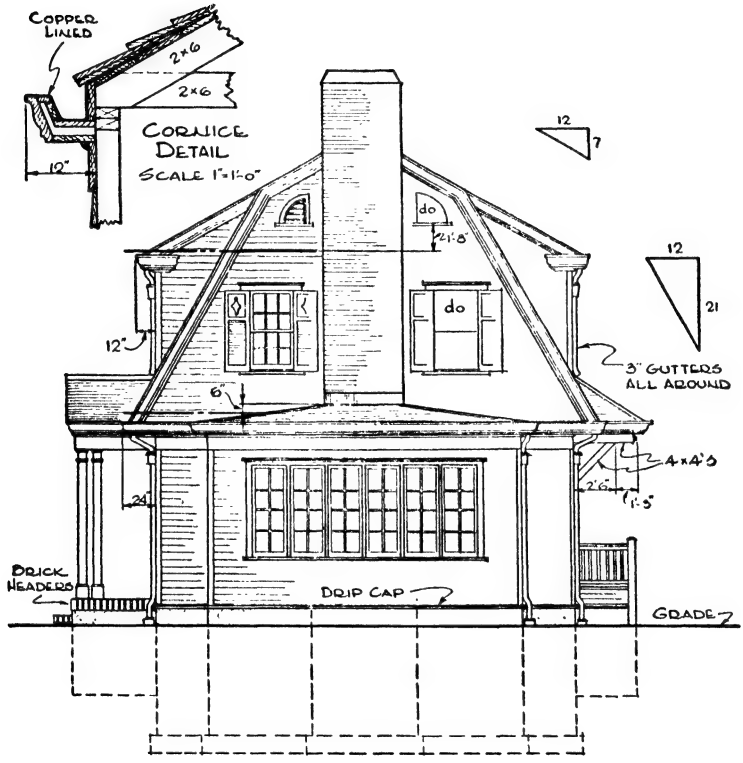


Fig. 37. Colonial House—Right Elevation

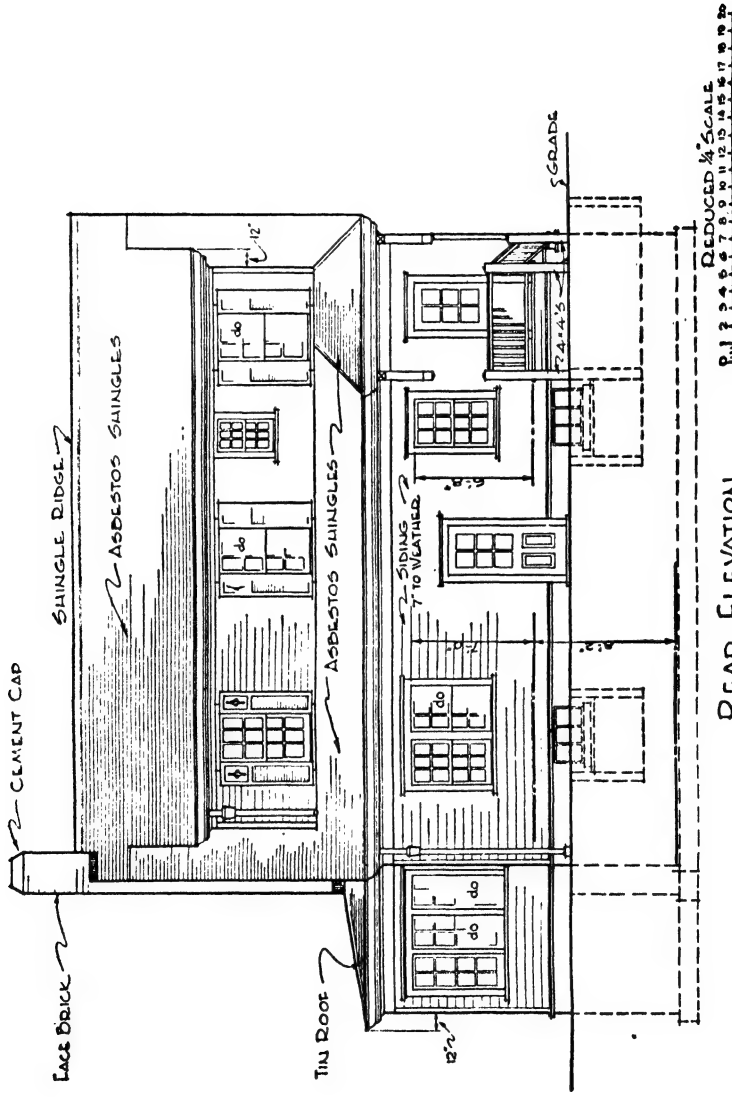


Fig. 38. Colonial House—Rear Elevation

TRACING

From the standpoint of technique and beauty, tracing is most difficult and requires careful, painstaking, and exacting work on the part of the draftsman. A tracing is a copy of an original pencil drawing which is made by placing the transparent tracing paper over the original drawing and tracing all lines, lettering, etc., in ink on the tracing paper. If the original pencil drawing has been well done and the proper care taken in tracing, the finished drawing should not only be accurate but also artistic.

Tracing Materials. There are many varieties of tracing cloths and papers being used, some quite expensive and others cheap. Tracing cloth is the best tracing material, but its high cost has a tendency to make its use somewhat prohibitive. Where hard use and long life are expected from a tracing, it is advisable to use the cloth. A tracing which is to be used only a limited number of times can be made on tracing paper. There are many kinds of tracing paper, which vary from good vellum to cheap tissue. Vellum is a tough wear-resisting paper and not easily torn if secured in good grade. Cheap vellum is poor economy. Plain tracing paper is generally easily torn and has very little resistance against cracking. The beginner is advised to procure a medium grade vellum paper for use in all his tracing work as it is comparatively inexpensive and will better serve his purpose.

All tracing work should be done in black India ink. Never use fountain pen ink. Colored India inks are sometimes used in tracing work to indicate various details, but this practice is not recommended for beginners.

Generally, tracing cloth or paper is a trifle oily due to its manufacture and handling. This causes ink to flow from a pen unevenly unless the proper precaution is taken. A small box of tire chalk or powder should be procured and a little of this powder rubbed over the surface of the cloth or paper before starting to ink. If this powder cannot be secured, stale bread crumbs may be used. However, the powder is recommended.

Making a Tracing. After the pencil drawing is completed and thoroughly checked, it should be cleaned and then brushed to be sure that no eraser crumbs remain. It will be assumed in this explanation that vellum paper is to be used. The vellum is put down

over the pencil drawing and thumb tacked the same as drawing paper. If tracing cloth is used, the dull side should be up. The lines of the pencil drawing can be easily seen through the vellum. After powdering the paper, the actual tracing can be started.

The line weights on a tracing are exceedingly important and for that reason the beginner should pay particular attention to them. Poor selection of line weights does a great deal toward ruining the appearance of a tracing. The line weights should be so selected that there is a gradual contrast between the main object lines, for example, and the less important object lines. In other words, the various lines on a drawing can be grouped according to the following rules. These start with the group that should have the heaviest lines, and end with the group that has the lightest lines.

After all lines are drawn in all groups, the lettering, arrowheads, and free-hand work is done. The inch and foot marks near dimensions should be the same line weight as figures, a little slanting and $\frac{1}{16}$ inch long. The drawing should now be checked very carefully to see that no small lines, dimensions, inch or foot marks, lettering, etc., have been omitted. The tracing should be cleaned, if necessary, signed in the title block, taken off the board, and trimmed.

Tracing Practice. Sometimes working drawings are made by penciling directly on the tracing material. A soft black lead pencil is used and blueprints are made from these pencil tracings. This practice is used widely as an economy measure. The resulting blueprints are not as clear and sharp but serve the purpose very well. It is worth while for the beginner to master the inked tracing because this practice will never die out entirely.

Line Weights. In inked tracings, especially, the beginner should strive to create line contrasts. This is not so easily accomplished on a pencil tracing but it can be done to some extent. This practice gives a drawing more life and character, makes it easier to read, and tones up the whole appearance. Therefore line contrast becomes one of the most important features of drafting technique.

The following table shows the various groups into which plans, elevations, and details fall as to line weights. In Group 1 the lines on the drawing are the heaviest. In Group 2 the lines are not as heavy as in Group 1. There should always be a sharp distinction

between the lines in Groups 1 and 2 with the lines in Group 2 the lighter. Then the lines in Group 3 should be lighter than the lines in Group 2, etc.

LINE WEIGHT TABLE

Floor Plans

(See Figs. 14, 29, and 30)

Group 1—Border, title block, and column lines for notes.

Group 2—Both outside wall lines, chimney outline, porch outline, line under titles, chimney flue outline, both ends of window symbols, lines inside of title block, sewer symbols, post symbols, cutting symbols such as is shown for the roof in Fig. 30, and the footing symbol.

Group 3—All partition lines, registers, radiators, warm air ducts, furnace symbols, stair railings, stairs, chute symbols, roof outlines as in Fig. 30, and lines in column for notes.

Group 4—All electric symbols, all kitchen and bathroom symbols, window and door symbols, circles for door and window sizes, and laundry symbols.

Group 5—All dimensions and extension lines and all crosshatching lines. The actual sizes for concrete symbol, earth, brick, etc., are shown in Fig. 27.

Elevation

(See Fig. 21)

Group 1—Border and title block lines.

Group 2—All corner or main outline of structure, all window and door outlines, all chimney lines, all roof lines, line under title, horizontal lines composing course of bricks at base of house, horizontal lines for bricks under windows, down spouts, floor level lines, and grade line.

Group 3—All invisible lines, lines composing muntins and sash of windows, and stucco symbol.

Group 4—All dimension and extension lines, all vertical lines for brick symbols around base of house and under windows, shingle symbols, and horizontal lines indicating brick on chimney. Fig. 27 shows the size and line weight for rubble stone symbol.

Details

(See Fig. 46)

The outline for all cross sections, etc., on a detail drawing can be made the heaviest. The line weight used should be comparable with the weight used for Group 3 of the floor plan. The manner of drawing the wavy lines for the wood cross section has already been explained, and the line weight should be the same as for Group 5 of the floor plan. Concrete, earth, and brick symbols are all shown in actual size in Fig. 27. Dimensions on detail drawings, as on all

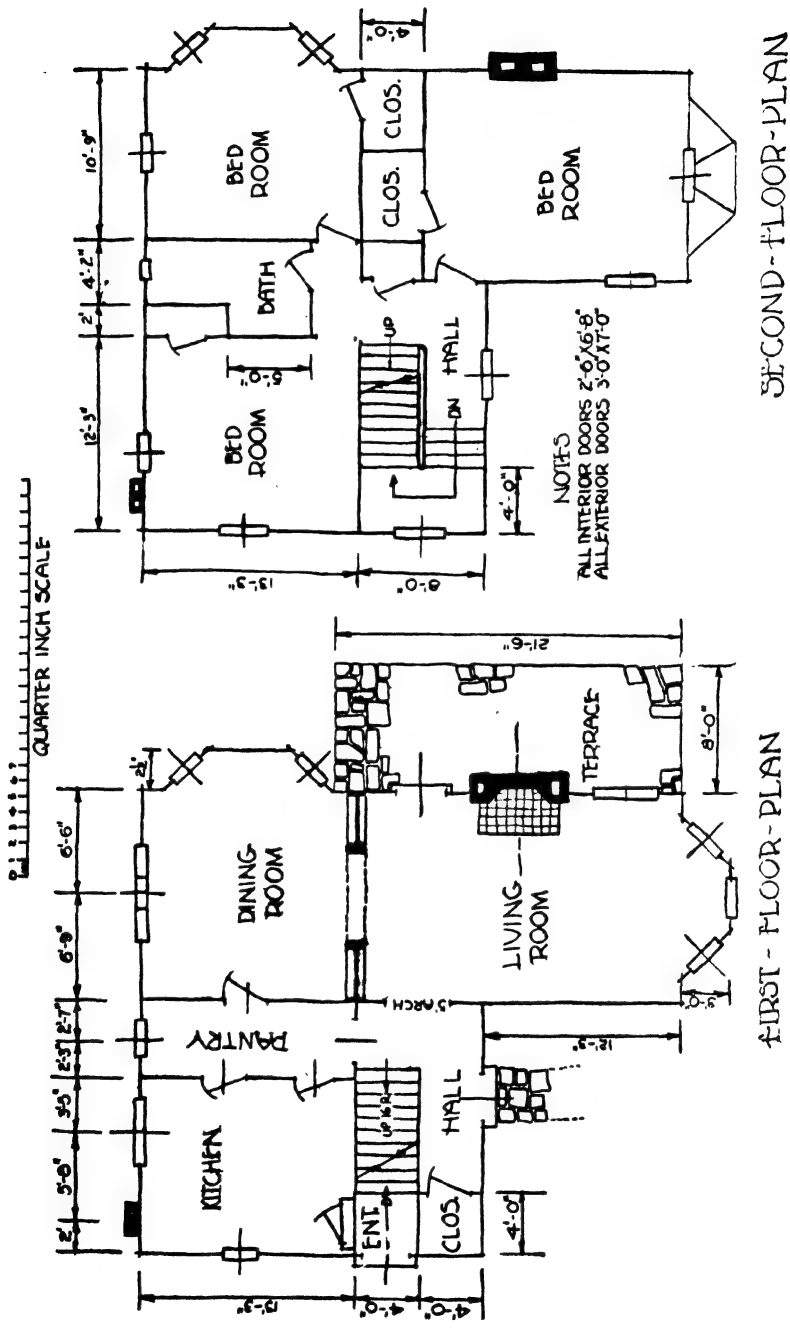


Fig. 39. Rough Sketch of Floor Plans for a Small House

drawings, should be the lightest lines on the plate. The above rules are not hard and fast rules and can be changed in many ways to suit various kinds of drawings.

ORDER OF INKING

In order to trace a drawing in ink with the greatest speed and accuracy the following suggestions are recommended.

1—Trace border line, title block, and column for notes.

2—Trace all circular lines.

Fig. 40. Perspective of House Shown by Floor Plans in Fig. 39

3—Trace all horizontal lines.

4—Trace all vertical lines.

5—Trace all inclined lines.

Note: Do not try tracing more than one group at a time because that would mean changing the ruling pen too many times and it is very difficult to keep the line weights the same in each group in that manner.

PRACTICE PROBLEMS

In Fig. 39 is a rough sketch of the floor plans for a small house. Fig. 40 is given as a guide to the elevation design. The student should now be able to draw the regular working drawings for first and second floor plans and also to draw the four regular elevations.

The student should not at this time attempt to render the elevations. He should just draw them like Fig. 38, for example. The ¼″ scale is recommended. Assume the house is entirely wood frame, that 2″ x 10″ first floor joists are used, that 2″ x 8″ second and attic floor joists are used, that rafters are 2″ x 6″, that siding covers the sheathing on the outside walls, that double flooring is used, that composition shingles are used, that face brick is used for the chimney, that the siding extends just below the top of the foundation, that a 2″ x 10″ sill is used on top of the foundation, that the Western Frame is used, and that the dimension from the basement to first floor to second floor to attic floor heights are 7′-6″, 10′-0″, and 8′-6″. Roof vertex is 9 feet above the attic floor. The student is supposed to decide on window and door sizes.

Ordinarily, window and door sizes are given on such drawings as Fig. 39. However, in this particular case they are left out to give the student practice in selecting them.

ARCHITECTURAL DETAILING

Thus far, in your study of Architectural Drawing, you have learned how to draw floor plans, elevations, sections, etc. You have learned symbols, how to check dimensions, learned more about lettering, how to scale drawings, correct line weights, etc. In general, you have mastered the basic and very important principles of drafting as applied to Architecture.

Now, you are ready to advance into the first principles of actual design. You are about to study Architectural Detailing. A finished structure is the aggregate of the details of that structure. So, in order to build up your knowledge in the proper sequence, it is logical to master the principles governing detailing before going further with your design course. Therefore, the aim of the following text material is to show the importance of details and how they are created.

Purpose of Details. When we look at a floor plan, we see merely the outlines of the walls and rooms, locations of chimneys, stairways, doors and windows, and other such information. In other words, a plan view is a horizontal section as illustrated in Fig. 3. When we look at an elevation view, we see only the exterior picture of a side view. It can easily be seen, therefore, that neither plan nor elevation views show anything more than some of the main dimensions and general shapes of rooms and their dimensions, halls, wall thickness, locations of fixtures, electric outlets, etc. This much information, while very necessary to the builder and to the heating and ventilating engineer, does not give them, however, the complete information that they need to actually build the structure or install various apparatus. Neither can an estimate of costs be prepared from such information as is given on simple plan and elevation drawings. Also it would be impossible to make up a bill of materials.

Therefore, the plan and elevation drawings of a proposed structure must be supplemented, or more fully explained, by additional drawings which will give the balance of necessary data. The *details*,

which should form a part of every set of drawings, supply this need. Thus a detail is a group of drawings which supply all information not found on plan or elevation or in the specifications.

Plate IX shows a group of simple items and the details for their construction. Take, for example, the Wren house shown in perspective at 30. It is possible to guess, from the perspective, about what its basic structure is even though no dimensions are shown. At 30, among the details, is a group of detail drawings from which we learn the size of the door or opening hole, thickness of all material, sizes of all parts, and the location or position of each piece. The student should become familiar with all other items shown on Plate IX.

Plates X, XI, and XII show a great number of details of a sort that aim only to indicate framing methods. As parts of an actual set of plans, these details would be dimensioned, have their location in the proposed structure indicated, and be taken up in the written specifications. The student should become familiar with these details because they are important in that they show standard and accepted practice in addition to teaching methods of framing. In connection with the above mentioned plates a careful study of Plates IV, V, and VI, should be made.

Plates VII and VIII and Figs. 11 and 12 are also fine illustrations of detail drawings. Take Fig. 11, for example. Note the exterior-elevation-interior. This is a common type of an elevation drawing. The only information obtainable from it is that it shows the window is double hung, its width and height, and in general its overall size and shape. But, such a drawing does not show how the window is constructed, how many pieces are used in it, the size of each piece, kind of material, and full dimensions. Therefore the elevation view would be worthless as a complete structural guide unless we explained it by means of detail drawings. The balance of Fig. 11 is devoted to showing such information as is really needed. These amplified or instructional drawings are the *details*, which show the *insides* or make-up of the window. Fig. 12 is another detail. In Plates VII and VIII details are combined with elevations to show the structural make-up of a door and door frame.

Refer to Fig. 14, as a further illustration, and note the enlarged partition between the dining room and kitchen. This plan

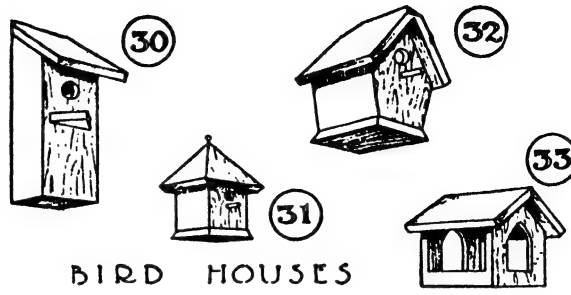
doesn't show nearly enough information. Here, as in most cases, the scale is too small to show detailed information. This illustration shows quite clearly how entirely handicapped a builder would be without a detail drawing. So, the natural reaction would be that the builder would look through the drawings in search of the required detail drawing. The estimator, ventilating men, etc., would all require the detail drawing. Now turn to Fig. 47. In this figure will be seen the detail drawing. This enlarges the partition to allow a clear illustration of all parts.

The student must keep in mind, at this point, that none of the detail drawings thus far studied was completely detailed. That is, many dimensions, specifications, etc., have been left out in order to simplify them so they would easily represent details for use in a beginning discussion. However, later on in this text, *complete* details will be taken up.

Refer now to Fig. 29 and note the window *J* in the right-hand lower corner of the plan. To a builder or estimator it would be evident that not all of the necessary information was given at this point because there are two retaining walls of concrete shown. These walls are dimensioned 4′-6″, and 3′-9″. The symbol at *J* also indicates other than an ordinary window. But the proof that there is some additional information among the drawings is the cutting line *H-H*. Such a symbol means that a section drawing has been made at this point.

The many examples of detail drawings illustrated thus far show their prime purpose, and the student should not have any trouble understanding that detail drawings illustrate what cannot be shown on the average plan or elevation drawing.

What to Detail. In general, any structural part or parts of which the entire shape, size, or dimensions are not visible on the plan or elevation views should be supplemented by detail drawings. There are two reasons for this. One of them, as has already been explained, is to supply the necessary information to the estimators, carpenters, etc., so that they can go on with their work. The other reason is more or less a legal question as explained in the following. A builder generally makes a bid for a proposed structure. In this bid he expresses himself as being willing to carry on the entire construction for so much money. If his bid is accepted, he signs a con-



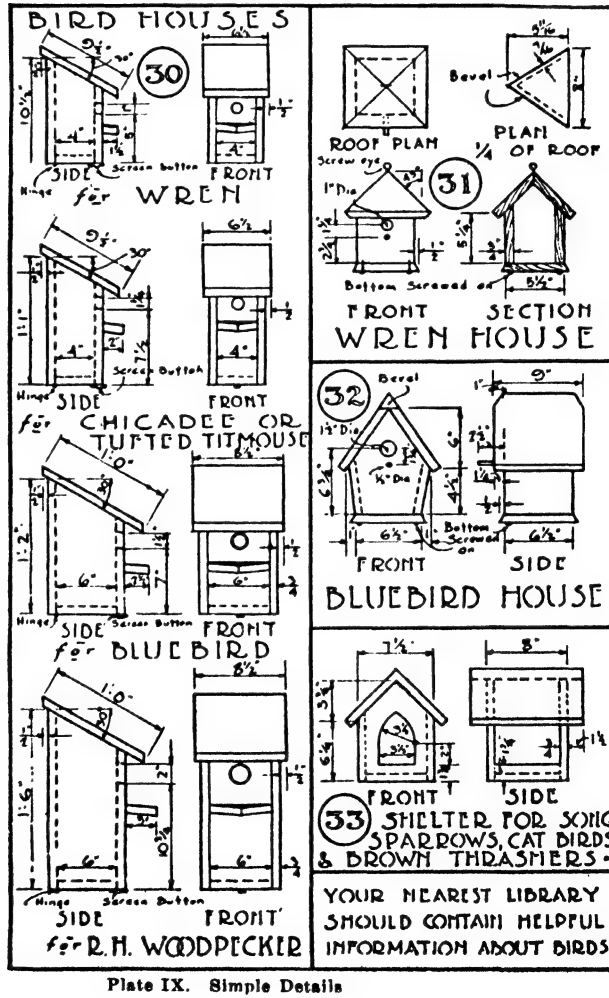


Plate IX. Simple Details

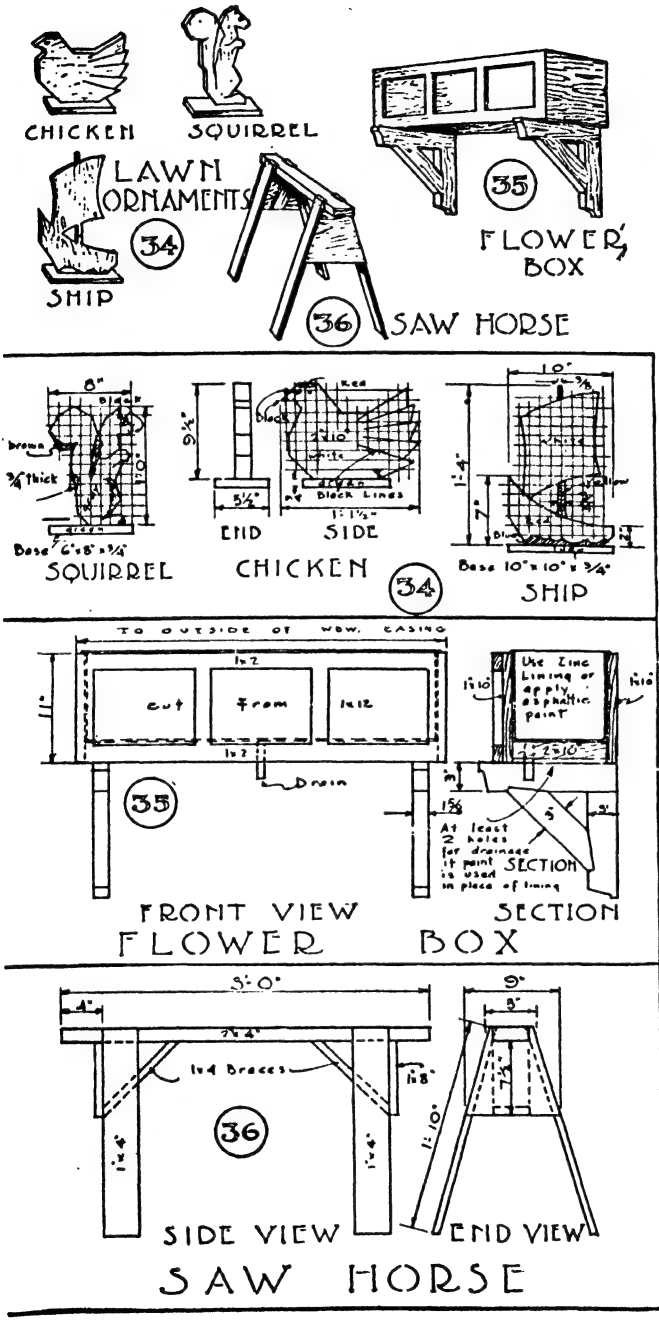
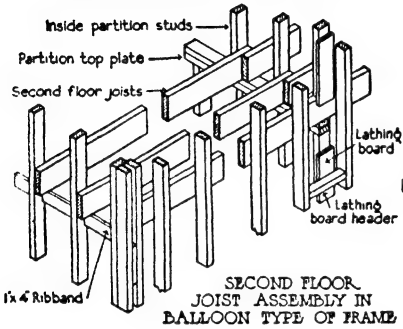
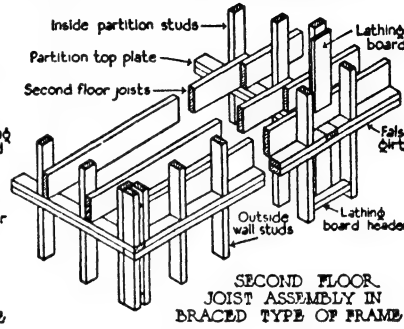


Plate IX. (Continued)

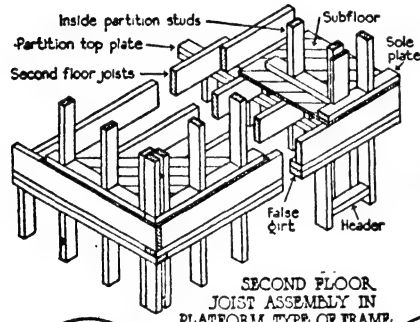
STANDARD DETAILS FOR HOUSE FRAMING



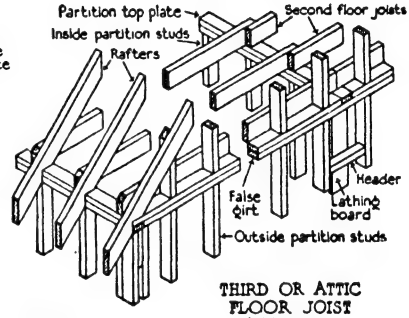
SECOND FLOOR JOIST ASSEMBLY IN BALLOON TYPE OF FRAME



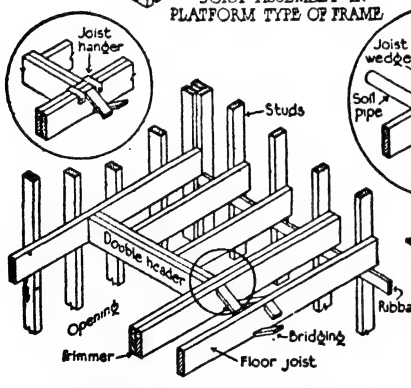
SECOND FLOOR JOIST ASSEMBLY IN BRACED TYPE OF FRAME



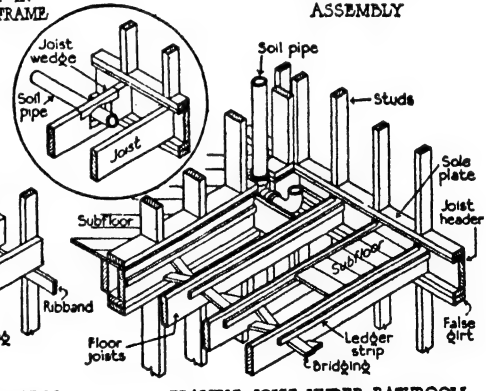
SECOND FLOOR JOIST ASSEMBLY IN PLATFORM TYPE OF FRAME



THIRD OR ATTIC FLOOR JOIST ASSEMBLY



FRAMING AROUND FLOOR OPENING



FRAMING JOIST UNDER BATHROOM

Plate X. Typical Framing Details

STANDARD DETAILS FOR HOUSE FRAMING

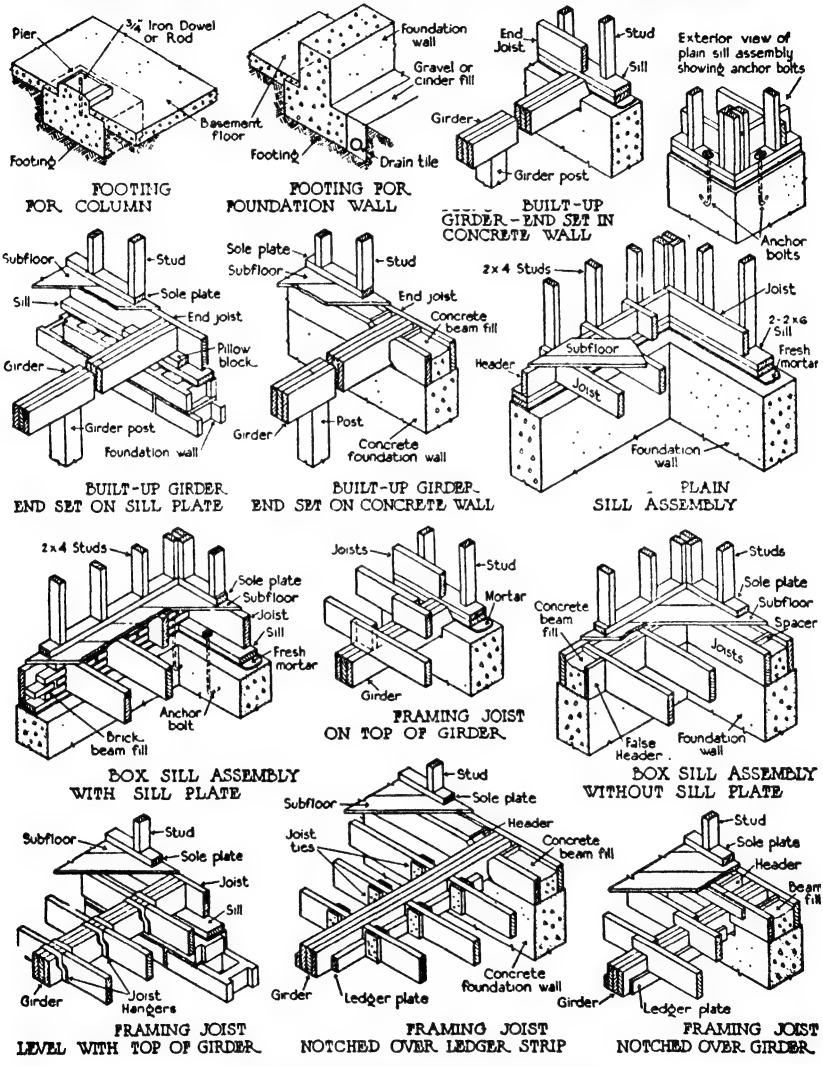


Plate XI. Typical Framing Details

STANDARD DETAILS FOR HOUSE FRAMING

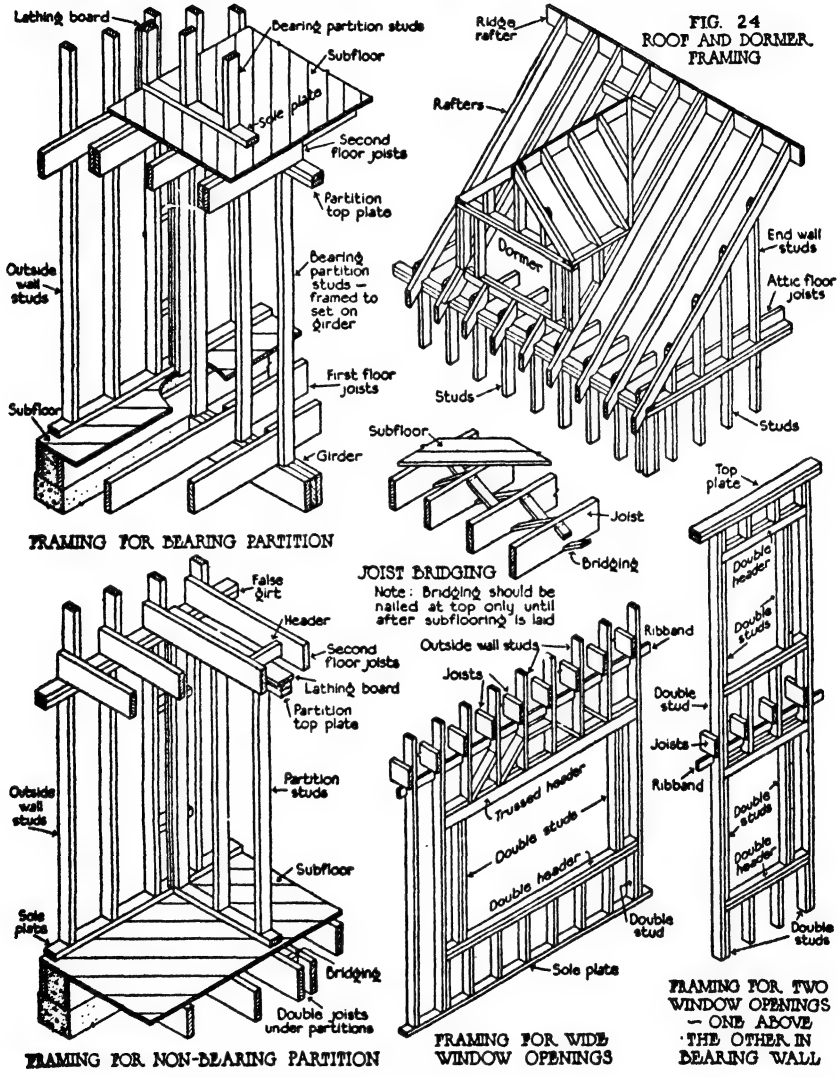


Plate XII. Typical Framing Details

tract and goes on with the actual construction. On a structure of any size or importance, the architect generally serves as supervisor or inspector. Thus the contractor is responsible for the job to the architect. If the architect finds that some part of the structure is not being built exactly as he wants it to be, he has authority to make the contractor tear out and rebuild it if he can prove that the working drawings pictured the situation at hand exactly as he wants it done. But, unless the working drawings exactly portray the situation, the contractor cannot be held responsible or be made to tear out and revise any part or parts. If a dimension is wrong on any of the working drawings, and the contractor, in following this dimension, builds a part of the new structure other than as planned, he cannot be held responsible. In like manner, unless a set of working drawings is fully detailed, the contractor is at liberty to use his own judgment as to various framing, etc. Sometimes the ideas of a contractor are not as good as those of the architect, resulting in inferior construction.

From the foregoing, it has become evident to the student that *all parts* of a proposed structure must be detailed. It is true that the specifications can easily take care of grades of material, etc., but only actual drawings picture dimensions and structural details.

There are exceptions, however, to the rule that everything must be detailed. These exceptions will be explained as follows: A great many items such as windows, window frames, doors, all trim, mouldings, stairs, types of wall finishes, flooring, etc., can be purchased already to incorporate into a structure. For example, there are many *standard* windows. Such windows are made and kept in stock by various woodworking manufacturers. They can be ordered by name or number. Standard mill work is specified by the architect as much as possible because it is cheaper. Standard windows, therefore, *need not be detailed.* They are simply specified by name or number or number and size. On the other hand, if some special shape or style of a window is wanted, which is not kept in standard stocks, then complete details have to be drawn so the mill will know exactly what size and shape to make such a window. Such a window is called "Special Millwork." This explanation of special and standard mill work also applies to doors, mouldings, gutters, and many other parts of a structure.

As an example of standard millwork or standard already built structural parts, refer to Fig. 29. Note window K in the coal bin. Then refer to the window schedule on the same drawing. You will see a catalogue number. This is therefore a standard window which can be purchased complete. The contractor should make it his business to buy this item so he can become familiar with it. However, if the architect wants to absolutely control the installation of this window, he must show a detail drawing, not of the window, but of the framing around the window. All other windows are also standard. For windows such as H, I, J, and K, the architect has specified the sizes of the openings in the walls and has left the framing to the contractor. In Fig. 14, all windows are standard millwork. Therefore, only their sizes and symbols are shown. The final specification is taken up in the written specifications.

In cases of frame residences, standard practice can also save detailing. Plates V and VI illustrate the Western and Balloon types of framing. Both of these frames are *standard*. If either one is to be used in a proposed residence, the written specifications can state that fact and also state any minor changes in addition to nailing practice, grade of lumber, spacing of studs, etc. Thus no detail drawings for the frame would be necessary. In the event that no standard type of framing was to be used, it would be necessary to show detailed wall sections like those shown in Plate IV.

Fireplaces constitute another item where the use of a standard product saves much detailing. If a standard make of fireplace is to be used, it can be specified in the specifications according to number, make, size, etc. If a non-standard fireplace is to be used, then detailed drawings must be made.

Other examples of standard and special items will be discussed later. It would be impossible to list all standard and special items as regards Architectural Design but the student will learn much from the following pages and from manufacturers' catalogues. There are also general catalogues in an architect's office with which the student should gradually become acquainted.

SPECIFICATIONS

The written specifications for a proposed structure and the detail drawings are very closely related. The purpose of a specification

is to supplement the drawings, setting forth those points in the proposed work which cannot be readily expressed by diagrams or figures. The principal object of a written specification is, therefore, to define the general conditions under which the proposed work is to be done, and to describe the qualities of the materials to be used. It also stipulates the kind and quality of labor to be used and contains all written instructions and descriptions that may be needed to indicate fully just what must be done. Sometimes specifications are printed on the drawings in the form of notes.

With the foregoing explanation of written specifications in mind we can quite easily draw up a comparison between them and detail drawings. Refer to Plate XV and study the elevation view of the cabinet. In written specifications covering the construction of this cabinet, we could definitely include such items as the kinds and quality of wood to be used, quality and kind of hardware, painting, quality of glass, general overall dimensions, number of shelves and drawers, etc. But with all of this information, a Cabinet Maker could not possibly go on with construction. The reason is because he requires additional information concerning *all* dimensions, shape of cabinet, shapes of all parts, sizes of all parts, manner of framing, etc. Therefore, the detail drawings, as shown to the right of the elevation view, are absolutely necessary. Also in Plate XV, are two other partially detailed drawings which picture the construction of the door and windows of which elevation drawings are also shown. The student should now have a full understanding of the difference between written specifications and detail drawings.

Written Specifications on Drawings. We often combine detail drawings and written specifications to a limited degree. This is done to make the drawings more complete, relieve the necessity of referring to the written specifications too frequently, and to help guard against errors. It is reasonable to conclude that a drawing, which also contains a few written or printed specifications is more complete because not only the structural information is available but the material or quality specifications as well. This gives the blueprint reader a complete picture. However, only the more important written specifications should be put on a drawing. *A drawing should never be so crowded, by such a practice, that reading it would become confusing.* It is time saving if a reader is not required

to refer to the complete written specifications for every small detail he finds in the detail drawings. One can guard against errors by placing some of the written specifications alongside of the detail drawings. The builder then would not be as likely to forget or be too negligent to refer to these written specifications. Care should be taken that *notes* and written specifications do not disagree. For examples of combined drawings and written specifications refer to Fig. 33. The information given under *Notes* can be classified as per this discussion.

Reference to Details. Detail drawings are put on sheets containing nothing but detail drawings, or they are put in available spaces on plan or elevation views, or a combination of both. Generally, all available space is used, without crowding, before any new or detail sheets are made, the idea being to keep the number of sheets down to a minimum. However, it is not possible to keep detail drawings near or on the same sheets with the main drawings in which they occur. Therefore, some means must be utilized to tell where the details for various parts of a floor plan, for example, can be found. Generally, a note is printed near the point, on the plan that is being detailed, which makes reference to another location or sheet number where the required detail can be found. Thus, if we found it necessary to show the details for the fireplace on sheet 10 instead of on the floor plan sheet, we would put a small note near the fireplace symbol, on the floor plan, which should be somewhat as follows—"Details for fireplace on sheet 10." Thus, the reader would know exactly where the required detail was and could turn to it without loss of time.

Titles for Details. Every detail drawing should have a clear and fully descriptive title which states exactly the purpose of the detail. Without a proper title the detail may prove confusing and in some cases worthless. Note the detail of section H-H on page 156. This title tells us exactly that the detail is for section H-H. Section H-H is found on sheet 3, page 59. If this title had not been clearly stated the detail would be meaningless. In this case, it would have been especially meaningless because, by studying sheet 3, Fig. 29, it becomes very evident that unless we were especially directed to section H-H, we would not likely suspect what part of the plan the detail was meant to illustrate.

Detail Indications on Main Drawings. Under "Reference to Details" on page 88, is given the most generally used method of indicating that there are detail drawings. There is also another much used method. If we desire to show a detail in a definite position or show the detail as we would actually see it, could we stand in a certain place, we then would draw a cutting plan through that part of the main drawing, and letter it A-A, or H-H, etc. This indicates that a section or detailed drawing has been made which shows exactly what the cutting plane cut through. Or, we can make it even more definite by showing an arrow pointing toward the cutting plane. In this case the detail drawing would indicate what could be seen, if one part of the cut portion could be moved away, and we could look at the remaining portion in the direction of the arrow.

Detailing and Design. Detailing and design are very closely related because any design must be detailed before construction can take place and therefore the details, to some extent, control the design. When designing a proposed structure, we first of all roughly sketch our ideas relative to its various parts. We may, for example, be confined to some certain type of architectural treatment such as Dutch Colonial, English Colonial, Spanish, etc. Or, we may have no definite architectural type in mind but are merely trying to design a well-balanced and attractive structure. In any case, however, and no matter how well our original sketches look, the details must be considered before the final working drawings are made.

The detail drawings will determine, to a great extent, what the final structural cost will be and thus become important aside from their basic use as guides for construction. To illustrate this, let us consider a roof. Perhaps our preliminary sketch shows an irregular shaped roof having many hips, valleys, and L's., but making a very beautiful effect. Further suppose that we were limited to a very definite final cost for the structure. Irregular shaped roofs are, in most cases, difficult to frame and costly to construct. If we started to prepare the details for the framing plans of this type of roof, we would very likely find that it would require intricate framing which would mean that material and labor costs would be excessive when compared to the maximum total cost allowance. Also,

we might find that the necessary framing would interfere with using the attic space for anything except storage space.

While this example is somewhat exaggerated, it does nevertheless serve to illustrate another important part played by details. To a lesser extent, details control room shapes, ceiling heights, wall thicknesses, and many other important features in a proposed structure.

TYPICAL DETAILING

Determining Required Details. As explained in preceding paragraphs, we must consider details before our working drawings are completed. With experience, we learn to judge whether or not certain parts of a design will cause any special or irregular detailing. Such details should be drawn soon after the basic design treatment has been created. The more ordinary details can be drawn during and after the main drawings have been made. The floor plans and elevations should be thoroughly studied and any part of the framing or structure in general that isn't fully pictured should have details drawn or the method of construction left to the ingenuity or experience of the contractor or the builder. If we know who the contractor or builder is to be and that he can be depended upon to use approved methods, it will be all right to omit details of lesser importance. But the safe method is to detail everything, or as much as we can, depending on time and expense. The following list comprises some of the most common features in an ordinary residence that ordinarily require detail drawings.

(1) Foundations and footings
(2) Chimney foundations
(3) Sills on foundation top
(4) Framing plans for floors
(5) Main wall framing
(6) Cornice
(7) Mouldings
(8) Any special windows or doors
(9) Fireplace and chimney
(10) Stairs
(11) Light wells for basement windows
(12) Roof framing
(13) Cornices for sun parlors or porches
(14) Connection between sun parlors or porches and main walls
(15) Furring

(16) Location of pipes or conduits
(17) Tile floors
(18) Tile sidewalls
(19) Any shelving
(20) Built in fixtures in Kitchen
(21) Built in fixtures in Pantry
(22) Built in fixtures in Breakfast Nook
(23) Fruit closets
(24) Arches
(25) Porch or entrance construction
(26) Dormer construction
(27) Terraces
(28) Cased and colonnade openings
(29) Ceiling beams
(30) Framing around chimneys or other openings

How to Show Details. Knowing that the principal purpose of detail drawings is to picture a type or manner of construction, it is only feasible to make the drawings in such a manner, or position, that will best show the items necessary. There are several ways of accomplishing this. Unless the item being detailed has its position, shape, etc., shown on a plan or elevation view, the detail must show this including elevation and plan views. Framing plans, such as those shown in Fig. 48, can be shown well enough in plan views. Any special framing around openings, etc., must be shown otherwise. Wall sections, dormer windows, cased or plastered openings, flooring, etc., can be shown by cross sections. Keep in mind that if the main drawings do not show all necessary views the details must.

Section Detail Drawings. The imaginary cutting plane shown must be placed so the section will show all members or parts of the item. Sometimes more than one section view is necessary in order to show size, shape, and location of all parts. Elevation and plan views must accompany section views if such isn't shown on the main drawings. Plates III and IV are sectional details. In both of these cases the elevation views were shown on regular elevation drawings so need not be repeated on the detail drawing. Fig. 11 also shows cross-sectional details. In this case, we can assume it was a window requiring special mill work so the elevation was shown also. Figs. 42 and 43 show more cross-sectional detail drawings.

Isometric Detail Drawings. The principles of isometric give us perhaps one of the best means of picturing construction details because by this principle we can readily make picture-like details,

which show up the details more like their true positions. As an illustration of this, refer to Plates IV, V, and VI. Plate IV shows cross-sectional drawings while Plates V and VI show isometric sketches. It is easily seen that the isometric sketches give a clearer picture of the framing than the cross-sectional ones. However, we cannot often make use of isometric details because of the added time and expense involved. Fig. 45, page 104, is an illustration of where both isometric and cross-sectional methods have been used to good advantage on the same detail. These examples, however, lack the very necessary dimensions.

Section details are used to the greatest extent because of the economy in time and expense. The item of expense must always be kept in mind if the architect is to make his fee profitable. Draftsmen would spend many times the amount of time were they to make all isometric details in place of section details.

What Scale to Use. One of the reasons why details are necessary is because the plan and elevation drawings, drawn generally to $\frac{1}{4}''$ or $\frac{3}{8}''$ scale, make partitions and other parts too small to show structural information. Therefore detailing is carried on with the use of the $\frac{1}{2}''$, $\frac{3}{4}''$, $1''$, $1\frac{1}{2}''$, and up to full size scales. The smaller or more intricate the item being detailed the larger the scale. Always state what scale has been used somewhere near to each detail. Detail drawings should be made to such a scale that all parts of items, dimensions, material symbols, etc., can be clearly and definitely shown. Experience will teach the student how to gauge what scale to use without having to make actual trials.

Dimensions. Unless a detail drawing is thoroughly dimensioned it will not serve its basic purpose. A builder might get the shape and material information, but unless he also gets full dimensions he must either use his own judgment or stop the work until the architect has been consulted. Missing dimensions cause no end of trouble and all drawings should be carefully checked accordingly so as to make sure that the dimensions are complete.

Dimensions can be shown in two ways, namely, by the arrow and extension line method and by specifications such as, $2''$ x $8''$, with an arrow pointing to the part involved. Referring to Fig. 46, we note on the wall section the various specifications such as $2''$ x $6''$, $2''$ x $8''$, and $2''$ x $10''$. In each case there is either an arrow

pointing to the part or else the specification is within the boundaries of the part itself. The parts not dimensioned in this way have been marked by the other method composed of the straight arrow and extension lines. Vertical and horizontal distances are always dimensioned in this manner. Members, such as studs, joists, and rafters are dimensioned by the specification method while the distance between them, their length or height, etc., requires the other method. A completely dimensioned detail drawing should have all members or parts dimensioned as to size, location, height, length, etc. Too much care can not be given to this part of detailing.

Symbols. The written specifications cover almost all material as to quality, kind, etc. But, the details should also show such information as far as possible. Referring to Figs. 51 and 53, it will be seen that almost every part of the section details have various symbols shown. The student is already familiar with Architectural Symbols but can refer to page 24 for a review. The free usage of material symbols on detail drawings thus makes the drawings a better picture of required conditions and at the same time helps to eliminate errors.

In some cases it is also desirable to print actual names and quality of materials on detail drawings as well as to show the standard symbol. For example, on a foundation detail we could show the concrete symbol as in Fig. 46, and then to make the detail more complete, we could show by a note what concrete mix is to be used. Or, where sheathing is shown on details, we could print a note to the effect that the lumber was of such a kind and grade, and was tongued and grooved. Or, where brick is shown, we could add a note specifying either common or face brick, kind and grade, size of mortar joints, mix of mortar, etc. These illustrations have been given to show the student what may be done in the way of more clearly picturing details and the required or specified condition.

DETAIL PROBLEMS

We are now ready to start actual detailing and in order to present a thorough explanation of the subject, a great many problems will be analyzed and detailed.

Problem 1. First a very simple problem will be considered.

Fig. 41 shows the plan and elevations for a one car garage of very simple design. We will assume that there are written specifications but the drawings should give most of the information.

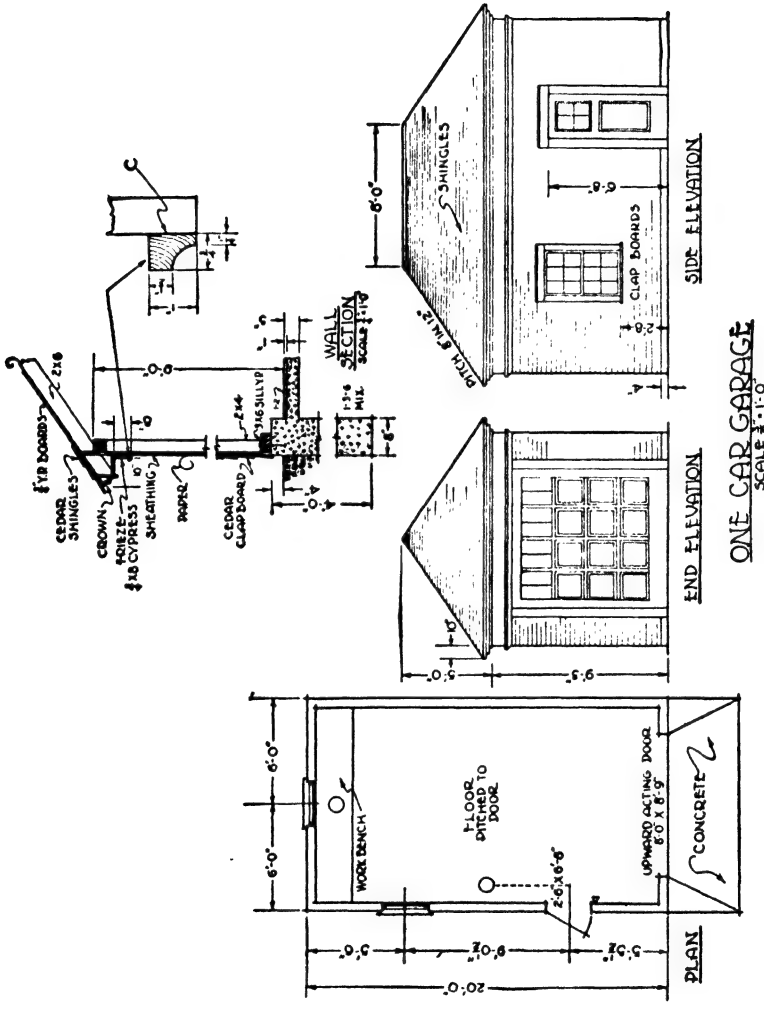


Fig. 41. Plans for a One-Car Garage

Some of the questions that will have to be answered by detail drawings are as follows:

*Q 1. Foundation

*Q = Question when questions are given.

Q 2. Floor
Q 3. Framing
Q 4. Siding
Q 5. Shingles
Q 6. Anchorage
Q 7. Doors
Q 8. Height
Q 9. Roof pitch
Q 10. Sheathing
Q 11. Cornice
Q 12. Windows
Q 13. Building Paper
Q 14. Concrete mix
Q 15. Special moulding at (C)

To give the above information we must draw details. These details must give all information not covered in the specifications and may duplicate some of the information given in the specifications.

Studying the plan and elevation drawings in Fig. 41 it seems that a cross-sectional drawing will best do the job. Therefore such a section, see Fig. 41, is drawn from the roof down through the foundation. The detailer is required to do a certain amount of designing in the selection of framing, etc. The foundation is drawn first. Then the framing is carried up and the roof drawn in. Siding, mouldings, etc., are next.

By using Fig. 41, the questions given above may be answered as follows:

*A 1. Foundation is of concrete. Mix is 1–3–6. Width is 8″. Extends 4′–0″ below grade and 4″ above grade. Anchors must be put in while concrete is being poured.
A 2. The floor is 4″ thick and of 1–3–6 concrete with a 1″ top coat of 1–2 cement. Level of floor at grade.
A 3. Framing is of 2 x 4 studs, 2 x 6 rafters, 3 x 6 sill, 2–2 x 4 plate, and ¾″ sheathing and roof boards. Rafters spaces 20″ O.C. Building paper between shingles and roof boards and between siding and sheathing. Sill anchored to foundation by 2 anchors on each side.
A 4. Siding is of cedar clapboards.
A 5. Shingles are of cedar.
A 6. Anchors are two on each side.
A 7. Doors covered by specifications.
A 8. Height of plate 9′–0″ above floor.
A 9. Roof pitch is 8″ in 12″.
A 10. Sheathing is ¾″.

*A = Answer when answers are given.

A 11. Cornice as shown, which is a standard cornice, is controlled by 8" and 10" dimensions.
A 12. Windows are D.H. placed as shown on plans and elevations each half composed of 6 lights.
A 13. Building paper used on roof and side walls.
A 14. Concrete mix 1–3–6.
A 15. Special moulding is ¾ x 1 x ½". And standard moulding that is very close to this can be used or special millwork be resorted to.

Our next group of problems will be for a complete set of plans as shown by Figs. 14, 21, 23, 25, 28, 29, and 30.

First, we will study over the plans and elevations to determine what parts will need detailing, assuming that we do not want to take any chances on the ability of the contractor to select the best framing methods or upon his integrity. Also we will assume that in this case full detailing is necessary to exactly fulfill the ideas and demands of the owner. Then we will make each detail a problem, detail it step by step and give questions and answers concerning it in order to better enlighten the student on the process and reasons for detailing.

Required Details. Remembering what has been explained thus far in the text, we will study over the above named figures and determine what are some of the items or structural parts that require detailing.

First, study Fig. 14. There are many items here that need detailing in order to picture their construction. We will list some of these items:

(1) Front steps
(2) Front entrance
(3) Rear steps
(4) Stairs and stairway
(5) Fireplace
(6) Chimney
(7) Wall section
(8) Partition between kitchen and dining room
(9) Arches over openings
(10) Kitchen Cabinet
(11) Trim
(12) Kitchen partition (3'–4" long)
(13) Framing under special partition
(14) Gutter or spout going to ground

Some other items such as flooring, light fixtures, 2 x 4 spacing, joist spacing, frame part sizes, plastering, windows, doors, sink, etc.,

are either standard and can be purchased complete or can be fully taken care of in the written specifications.

Next, study Fig. 30. We will again list some of the items for which details are necessary.

(1) Balcony outside of windows at stair landing
(2) Stair framing
(3) Closets
(4) Partition between bedroom No. 3 and bathroom
(5) Framing around chimney

Next, study Fig. 29.

(1) Area ways around basement windows
(2) Ash removal space
(3) Girder support (Columns)
(4) Foundation under living room bay
(5) Stairs
(6) Girder bearing in foundation
(7) Footings under columns

Next, study Fig. 21.

(1) Dormer
(2) Roof framing
(3) Entrance framing
(4) Cornice
(5) Chimney
(6) Downspouts
(7) Stonework

Next, study Fig. 28.

Requires no details other than those mentioned in connection with other figures.

Next, study Fig. 25.

Requires no details other than those mentioned in connection with other figures.

The details thus far mentioned are those items for which no detailed dimensions or of construction in general have been given on the plans or elevations. The vertical positions of windows are given by dimensions on the elevations. Items such as stucco, shingles, down spouts, roof boards, stone design for chimney, masonry, coal chute, etc., can be described clearly or specified by make or catalogue number in the specifications. The student should take particular care to notice that in case of each item mentioned for detailing, it is easy to understand that construction could not go on unless details were provided.

We can now start the actual work of drawing the details.

Problem 2—Front Steps. Referring to Fig. 14, we find that the front steps are dimensioned only partially as to horizontal dimensions. A great deal more must be known before construction could take place. The questions a builder would want the detail drawings to answer are as follows:

Q 1. What materials are used?
Q 2. What is the riser height?
Q 3. What is thickness of flooring?
Q 4. How are foundations to be made?
Q 5. How deep are foundations?
Q 6. What concrete mix is to be used?
Q 7. How are steps and flooring attached to main wall?
Q 8. What color, if any, will flooring be?
Q 9. Do treads extend out beyond riser?
Q 10. What kind of mortar is to be used?
Q 11. How are bricks set?

In order to answer these questions, the detail drawings will be made. Studying the plan view in Fig. 14, it seems that two details will be necessary to clearly answer all questions. We want to know all vertical dimensions as well as see the shape, location, etc., of all other parts and this cannot be done unless we draw a section through both the long and short sides of the steps and flooring. Therefore we will imagine a cut has been made running through the steps and flooring parallel to both long and short dimensions, namely, 7′-0″ and 3′-3″ + 3″ (3′-6″ in Fig. 42) dimensions. This cut is passing through the middle point. For example, the cut parallel to the short dimension should be a vertical line that would intersect M in the front door symbol.

Seeing that we want to show positions of bricks and because the entire unit is not very large we should use a scale that will enlarge everything considerably. In this case, a scale of 1″ = 1′-0″ can be used because it will make even the bricks and mortar joints easy to see. We are now ready to draw our detailed section drawings. Here is where design enters into the work as well as details. We shall have to design the entire unit.

Now, refer to Fig. 42. Here is pictured the section made by the cutting plane parallel to the short dimension. Line AB was drawn first at a level the same as the joint at the foot of the riser in the door. The line was made according to the dimensions which are shown in Fig. 14. The sill was designed approximately 16″ above

grade so that more headroom could be had in the basement without it being too deep. The distance from line AB to the grade is 12″. The elevation, Fig. 28, shows that two risers are required. Thus each riser will be exactly 6″. The treads are each 12″, as shown in Fig. 14. The lower tread can now be drawn in. Rather than go to excessive time and expense, the space between line AB and the grade will be solid concrete. The foundation, for the front part of this unit, is shown as 3′ below grade so that its bearing on the soil will not be affected by frost. The 8″ thickness for the foundation was selected so as to give a good sound foundation. The dimensions are put in to

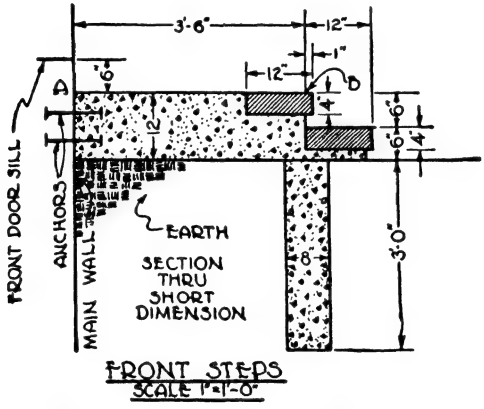


Fig. 42. A Cross-Sectional View of the Front Steps as Shown in Fig. 14

show the size, shape, and location of all parts. These dimensions must check accurately with those shown on the floor plan, Fig. 14.

Fig. 43 shows the section as created by a cut parallel to the long dimension. This figure shows the foundations on the sides and the positions of the bricks also on the sides. The student should study carefully Figs. 42 and 43 until he is certain he understands the connection between them and Fig. 14.

The questions on page 98 can now be answered.

A 1. Studying Figs. 42 and 43, we find that concrete is mostly used along with face brick. Four anchor irons are also necessary.
A 2. Fig. 42 shows the riser height to be 6″.
A 3. Figs. 42 and 43 show that the flooring is 12″ thick.
A 4. The foundations are to support the stair unit all the way around.
A 5. The foundations are 3′–0″ below grade line. They are 8″ thick.

A 6. The mix for concrete is shown as 1–3–6.
A 7. Four anchors are used as shown in Figs. 42 and 43.
A 8. The color of top coating will be red.
A 9. Fig. 42 shows that the treads extend beyond the face of the riser for a distance of 1".
A 10. The mortar specified is ½ sand and ½ cement and colored red.
A 11. The bricks are set on edge with ¼" joint and red colored mortar.

Problem 3—Rear Steps. Refer to Fig. 14. The only information given on this plan view concerns the length and the width at

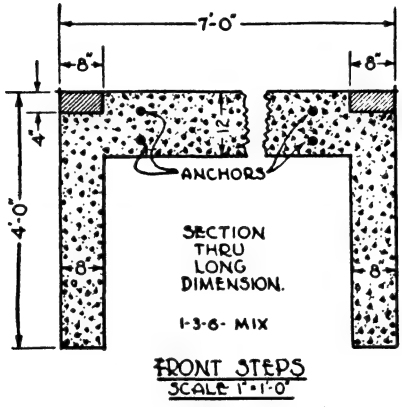


Fig. 43. A Cross-Sectional View of the Front Steps as Shown in Fig. 14

one end. There are many questions to be answered in the form of a detail section drawing. The questions are as follows:

Q 1. What material is used?
Q 2. What are dimensions?
Q 3. What are tread and riser sizes?
Q 4. Do the treads have nosing?
Q 5. Are there foundations?
Q 6. What are foundations like and what are dimensions?
Q 7. What is floor surface to be like?
Q 8. What level is floor surface?
Q 9. How are stairs anchored?
Q 10. What mix, if concrete?

In this case the plan view could have been a little more definite as to dimensions. Riser and tread dimensions could have been given, but since they are not we will show them all on our detail drawings. Studying Fig. 14, we can determine that the whole stair unit is a rectangle 2'-7" by 5'-9". Therefore, we need not draw

another plan view in our detailing. Also because the steps appear plain, without ornament, such as are in the front steps, it seems that one section view will be ample to clearly picture the construction and answer all necessary questions. In order to picture risers and treads, it is necessary to imagine the cutting plane being parallel to the short dimension. Notice the W in the rear door symbol. The cutting plane can be thought of as being vertically above this letter and we can look at the cut portion from either side.

As a design feature, it is desirable to have the top tread or flooring to be on same level as the door sill. Also, as an economy feature the steps should be plain.

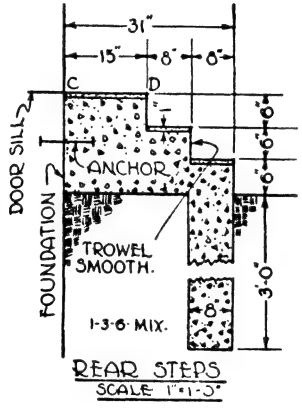


Fig. 44. A Cross-Sectional View of the Rear Steps of the House Shown in Fig. 14

A scale of 1″=1′-0″ will show this detail nicely as there are no special or intricate features.

The front steps have only two risers as shown in Fig. 42. But there is a third riser which can be seen within the door symbol in Figs. 21 and 14. This comprises a separate detail. So we have three risers, in all, for the front entrance. We must, therefore, have three for the rear steps as the first floor is all on the same level. Therefore, to draw the detail, Fig. 44, we draw a horizontal line CD at the same level as the door sill. The entire width of the stair unit is 2′-7″=31″. With three risers we will need two treads. The third tread, or flooring, isn't counted as a tread. The plan view shows the flooring wider than the treads so, as a matter of design, each of the treads are made 8″ wide and the flooring 15″ wide. All together

they equal 31″. The risers must be the same as those in the front steps. Because of the width being only 31″, no foundations will be needed under the ends of this unit. We will put a foundation under the entire front and carry it down below frost level. The questions can now be answered fully and construction carried on.

A 1. Concrete.
A 2. Detail in Fig. 44 shows all dimensions.
A 3. Treads are 8″ and risers 6″.
A 4. Treads do not have nosings.
A 5. There is a foundation composed of an 8″ wall under the first tread, as shown in Fig. 44.
A 6. Fig. 44 shows the dimensions. This foundation extends full length of steps under first tread as shown.
A 7. Flooring is to be simply a 1″ coating of surfacing composed of ½ sand and ½ cement.
A 8. Level of floor is same as floor of residence.
A 9. The entire stair unit is anchored to the main foundation wall by two metal anchors.
A 10. The concrete mix is 1–3–6.

Note.—Sometimes steps, such as these, are poured at the same time as the foundation so as to be an integral part of the foundation.

Problem 4—Wall Section. Neither the floor plans nor the elevation drawings show the construction of the walls, sills, framing, etc., which apply to the walls. The elevations show that stucco is to be used but other than that no information is given. Thus, there are a great many questions which must be either answered by a detail drawing or left to the builder. It is best to actually show them. A few questions concerning wall construction are as follows:

Q 1. What kind of a sill is used?
Q 2. Is sill bolted to foundation?
Q 3. Is wood sheathing to be used?
Q 4. Is metal lath used?
Q 5. How is lathing secured?
Q 6. What size sheathing is used?
Q 7. Is sheathing placed diagonally?
Q 8. Is second floor header and plate of usual construction?
Q 9. Is double flooring specified?
Q 10. What kind of a watershed is used?
Q 11. Are 2 x 4 studs used?
Q 12. What are foundation dimensions?
Q 13. What are footing dimensions?
Q 14. Is building paper used?

In order to show a full two-story height of wall detail, we will choose a place that will most clearly show this. A section view

is the best to use. Because of the size of this detail, it is best to use a scale of 1½″=1′-0″. Refer to Fig. 14. We will imagine our section cuts through window C in the lower left-hand corner of the living room. This will cut through window E of first bedroom on second floor. The section runs up through the cornice and down through the foundation and footing. To better understand a section of this sort, try to imagine that you have actually cut the wall of an actual house and that by moving the wall to one side, after cutting, you could see the inside of the wall. Before answering the questions relative to this wall section, a few such illustrative sections will be discussed.

In Fig. 45 at A and B are shown two typical wall sections with the most important parts shown and named. Drawing A illustrates the common type of brick veneer wall with a frame like the balloon frame shown in Plate VI. By comparing the frame for drawing A in Fig. 45 and the frame in Plate VI, it will be noted that the same framing principle is used. The brick work is only anchored to and actually supported by the frame. At C, in Fig. 45, is shown an isometric drawing which shows in a more pictorial manner the same wall as illustrated at A. The student is urged to study drawings A and C until he can easily picture in his mind one from the other.

At B, in Fig. 45, is a less common type of a wall constructed of hollow tile and surfaced with stucco. At D is shown an isometric drawing taken at the point where the first floor joints are supported by the wall.

At A, in Fig. 46, is another quite common type of wall having a balloon frame with stucco surface. The isometric drawing at C gives a pictorial explanation of this wall. Study drawings A and C until their relationship is clear. At B, in Fig. 46, is perhaps the most common type of western framing with siding surfacing. The isometric drawing at D shows this pictorially. There are other types of walls used, but in all cases the wall section is drawn following the same principles as shown in Figs. 45 and 46. Any section for walls should show all parts clearly and should also show necessary dimensions.

Referring now to the wall section for Fig. 14, we will again study drawing A in Fig. 46. It will be noted that this wall section is completely named as to all parts and fully dimensioned, whereas, the

other wall sections in Figs. 45 and 46 are only partly named and not dimensioned. The reason for this is that these other wall sections

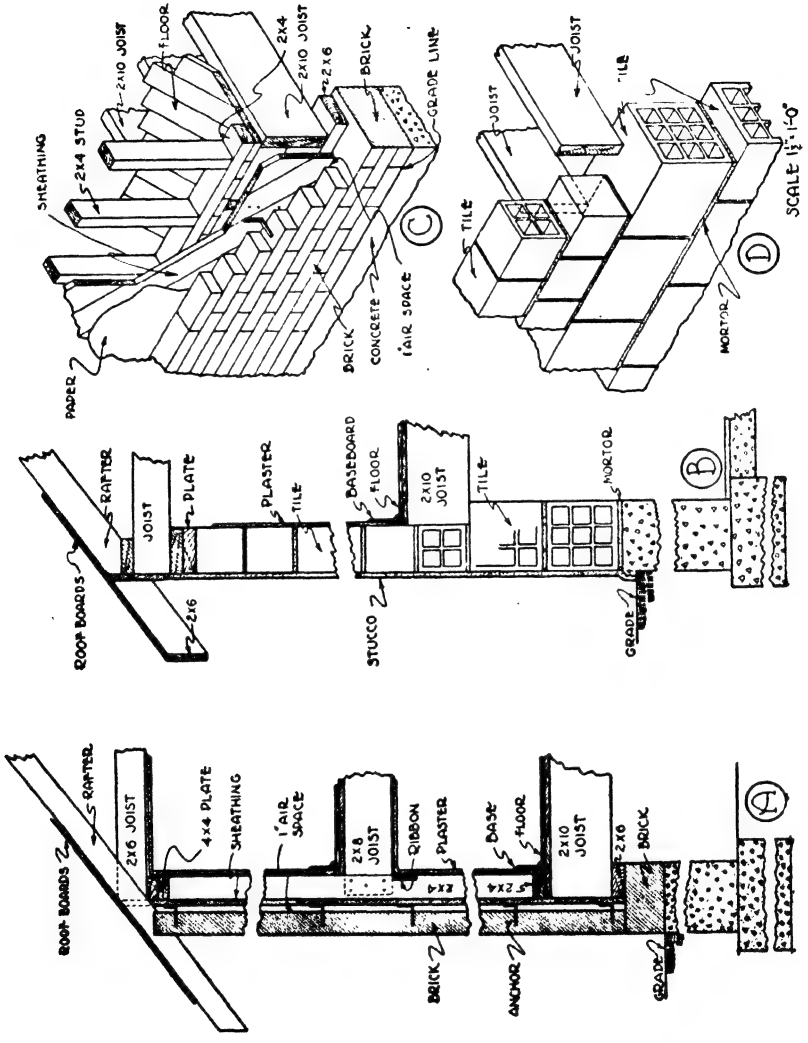


Fig. 45. Wall Sections for Brick Veneer A and Hollow Tile B

were only drawn so far as to illustrate a general principle. In the following all explanations refer to drawing A in Fig. 46. As previously stated a scale of $1\frac{1}{2}''=1'\text{-}0''$ was decided upon in order to more clearly show all small parts. Study this drawing carefully

as it is a complete wall section and therefore a valuable part of the working drawings.

We can now answer some of the questions concerning this section.

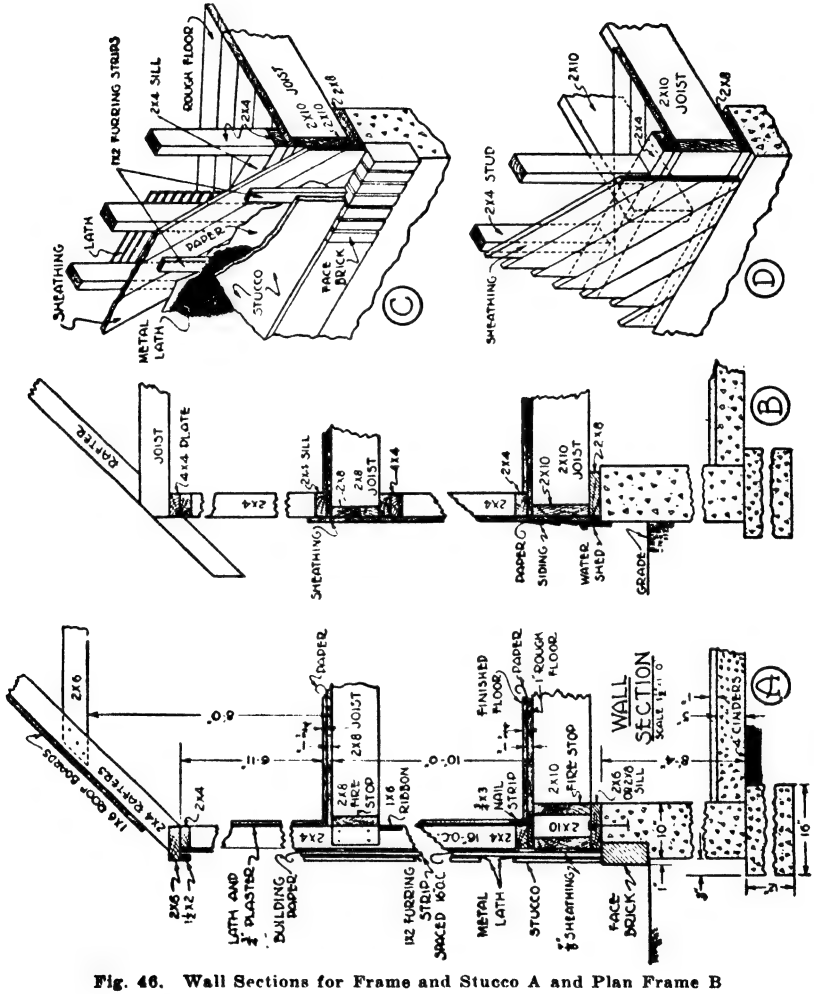


Fig. 46. Wall Sections for Frame and Stucco A and Plan Frame B

A 1. The sill is shown to be a 2 x 6. Its position is clearly indicated.

A 2. The anchor shows that the sill is bolted down. The specifications should specify the spacing or number and size of these anchors.

A 3. Wood sheathing is to be used.

A 4. Metal lath is shown on the drawing so it must be used as a base for the stucco.

A 5. The drawing shows that 1 x 2" furring strips are to be nailed to the sheathing on 16" centers and that the lathing is nailed to these strips.
A 6. The drawing shows ⅞" sheathing.
A 7. Ordinarily such a specification is not shown on the details because it is most common practice to put the sheathing on diagonally as shown in drawing C in Fig. 46.
A 8. Balloon framing being specified there will not be a header or plate. Instead the studs are full length and the joists at second floor level are spiked directly to the studs and secured by a 1 x 6" ribbon.
A 9. Yes. At both first and second floors. The rough flooring is 1" thick and the finish flooring ¾" thick.
A 10. The watershed is shown to be a series of bricks set on end into the concrete wall.
A 11. Yes, 2 x 4 studs are shown.
A 12. The drawing shows that the foundation must be 10" thick and 8'-4" above surface of the footing.
A 13. The footing is 12 x 16" in cross section.
A 14. Building paper is shown. It is to be nailed directly over the sheathing before furring strips are nailed into place.

In this manner all questions relative to the wall construction are answered including the stucco surfacing, its mix, thickness, etc. Note that this detail drawing also shows sizes of rafters, roof boards, ribbons, etc. The student will also note that the detail gives a clear picture of the complete wall section all of which controls actual construction and acts as a general specification governing sizes of material, locations, etc.

Problem 5—Partition Between Kitchen and Dining Room. Fig. 14, the first floor plan, shows a special or out of the ordinary type of partition between the kitchen and dining room. It is obvious that detail drawings will be necessary in order to show the construction, because the floor plans cannot show the needed information.

This partition is a special design aimed to make a small home more efficient. Here is one place where the detailer must do design work, too, as previously mentioned. The aim of the partition is to conceal heating ducts as shown in Fig. 47, at F and E; provide a chute D from second floor to basement; provide a space for plumbing pipes C; give drawer space for dining room B; and provide space for a table that can be folded and hinged into the space at A, thus taking less room in the kitchen at other than meal times. The designer has thus accomplished a great many conveniences without taking up too much room in a very small home.

Besides requiring specific details as to the shape and construc-

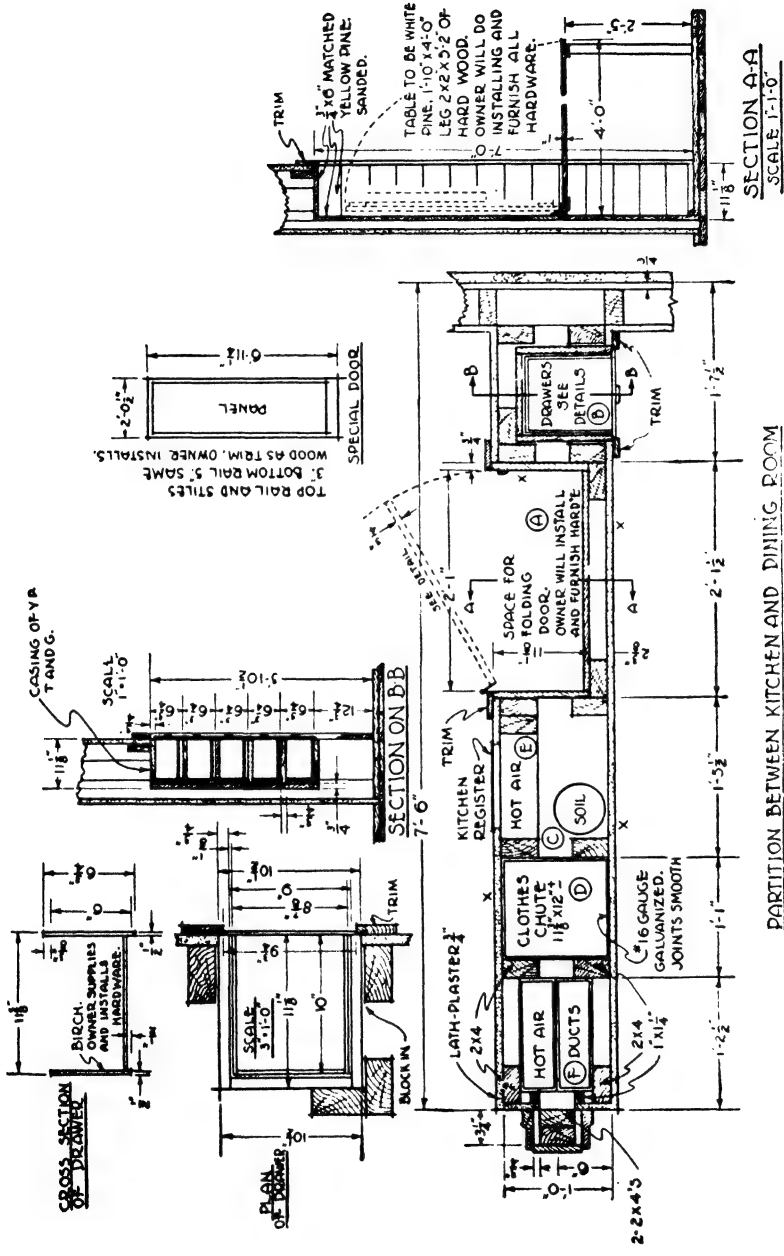


Fig. 47. Details of the Partition Between Kitchen and Dining Room of Cox Residence

tion of the partition, some special millwork will have to be detailed for the table and the drawers in the dining room.

Some of the questions that require answering are as follows:

Q 1. What size is the clothes chute?
Q 2. How is the clothes chute made and what finish is required?
Q 3. What is the exact location of clothes chute?
Q 4. How is partition to be framed?
Q 5. What size framing members are to be used?
Q 6. What parts are to be lathed and plastered?
Q 7. What is size of space for table?
Q 8. What is the table like?
Q 9. Where will the table be made?
Q 10. How is the table fastened to the wall and how does it function?
Q 11. What are the general dimensions?
Q 12. What is the exact location of soil pipe?
Q 13. What about the trim?
Q 14. What kind of lath is to be used?
Q 15. What size door is to be used for table space?
Q 16. Will door be of usual kind?
Q 17. What about the kitchen register?
Q 18. What about hot air ducts?
Q 19. What size are the drawers, their location, etc.?
Q 20. How is area taken up by the encased table?
Q 21. How is area taken up by incased drawers in dining room?
Q 22. What kind of wood for questions 21 and 22?
Q 23. Hardware?
Q 24. Electric outlets?

To answer such typical questions a group of details must be drawn. It is best to start with the main outline of the partition and draw it carefully to scale. The 2-inch scale was selected so as to make the various parts as large as possible without requiring a sheet larger than the others. Next, the principal parts of the partition such as at A, B, C, D, etc., are carefully thought over to ascertain the possibility of fitting them all into the allotted size of the partition. For example, the size of hot air ducts is determined and noted. The minimum size for the chute is determined, keeping in mind that too small a space would cause objects to clog the chute. From the owner, it is found that dining room drawers are to be used for silverware only and need not be as much as 12″ long and wide. Further thought indicates that the drawers should be near the corner so as to be handy and not be too prominent.

The owner has in mind a small table so dimensions for this item can be decided last. From the heating calculations, which are sup-

plied by the designer, it is found that if the ducts can each be about 12″ wide and about 4″ thick their requirements will be taken care of. The kitchen duct can be somewhat shorter due to its shorter length. The approximate size of 12 x 12″ is decided to be the minimum for the chute as learned from previous experience. The kitchen hot air duct is left to occupy whatever space is possible. The owner states that he wants the table near enough to the window so that a chair can be put in front of the window and in that position be suitably placed for use at the table.

Finally, in studying the second floor layout, it is seen that the two doors at Q are almost side by side and close to the outside wall. The chute opening is seen to the left of them. This would bring the chute opening to about the middle of the bathroom which is considered satisfactory. Next, we consider the framing and for simplicity the usual 2 x 4 type is used. The student should now understand that such special details must be thought out from all angles before any parts are definitely located. This sometimes requires considerable time and even then much changing is often done as the scaled drawing is in progress. The two hot air ducts are to supply the bathroom and third bedroom, so they can be the maximum distance from the outside wall and still arrive at convenient locations in the two rooms named.

It will be seen in Fig. 14 that there is a door at the end of the special partition. Therefore, the extreme end of the partition must include the door framing. The usual double 2 x 4's are drawn plus a third one to form part of the partition, as shown at the end of the plan view of the partition in Fig. 47. The corners of the partition require 2 x 4's and to gain space for the ducts these 2 x 4's are placed with their long dimensions parallel to the partition. To provide a means of fastening the other ends of the ducts and also to provide a means of supporting the plaster, two more 2 x 4's are placed at a distance of 1′–2½″ from the corner. To save space at this point, the 2 x 4's are placed as shown in Fig. 47. Thus, between the sets of 2 x 4's so far placed there remains about 12″ for the ducts. The space is wide enough for two 4″ ducts.

The chute is next placed and occupies the amount of space previously determined. The dimensions are given and followed by a plus or minus sign because the space may vary somewhat because

of 2 x 4 dimensions and slight errors in erection. This cautions the tinsmith not to make up the chute until the framing is in place. Following the chute two more 2 x 4's are placed in the position shown in order to save space. These 2 x 4's support the chute and provide a backing for plaster. The duct for the kitchen register is allowed practically 12″. Then the corner post for the table closet is put in place. It is composed of two 2 x 4's to provide rigidity at a point where a door is hung.

Next, it was finally decided to allow a 10½″ space for the drawers. The 2 x 4's around this area are to form the required shape, serve as plaster backing, and give rigidity at points needed. The casing for the table closet must also have backing for nailing. Now that the drawer space is allotted, the kitchen duct in place, and the necessary framing located, the remaining area can be used for a table closet. Calculations show a clear space of a little more than 2′. At this point it is seen that all items are properly located and all have the required space so the smaller details can be drawn in. As such a detail progresses, even in trial drawings, *accurate* dimensions must be put in.

There is plenty of room for the soil pipe at C and ample space for other plumbing pipes. The table closet should be cased, and the owner advises that matched yellow pine is satisfactory. Three-quarter inch stock is selected. The same applies for the casing around the drawers except that the latter casing must be tongued and grooved to keep out dirt. The next step is to *accurately* check all dimensions, keeping in mind that 2 x 4's actually measure 1⅝″ x 3⅝″. Lath and plaster together are ¾″ thick as specified by the owner. Care should be taken to see that all parts or locations are dimensioned. Also care should be taken to see that the complete section is shown. Some things must be detailed again in order to clearly show their construction. Note cutting line A-A. Section A-A, scale 1″=1′-0″, shows a vertical cross section of the table closet. The full pictorial affect is shown plus dimensions, notes, etc., for the whole idea. This supplies the dimensions that could not be shown on the plan detail. The door for the table closet is special millwork and is detailed accordingly. Section B-B, scale 1″=1′-0″, shows a vertical section through the drawers and supplies all vertical dimensions and other

information as clearly shown. The section to the left of section B-B is given a larger scale (3″=1′–0″) detail which shows a plan of the drawers and the casing around them. Here more needed dimensions are given. Above this is a section of one of the drawers showing the dimensions, kind of wood, and shape. As a special note on the enlarged plan of the drawers, there is the specification, "Block in." This infers that the casing is a little smaller than the distance between the 2 x 4's and that the carpenters can fill this space at various points with pieces of shingle in lining up the case. This extra space allows for inaccuracy in construction and the drawer millwork. It will be noted that drawers are special millwork and thus require special drawings.

From the foregoing discussion and the following answers to typical questions, the student will learn what is required on details and how this information is used.

We can now answer some of the typical questions as listed on page 108.

A 1. The clothes chute will be approximately 11⅜ x 12″ but this will not be made until all 2 x 4's are in place.

A 2. The chute is made of galvanized sheet iron of No. 16 gauge. The joints are to be smoothed so there will be no chance of catching clothing.

A 3. The chute location depends on the four 2 x 4's at its corners. The dimensions from the end of the partition approximate the corner location.

A 4. The framing is shown complete on the detail plan. Positions of a few key 2 x 4's are shown by the dimensions 1′–2½″, 1′–1″, 1′–5½″, 2′–1½″, and 1′–7½″. All others are placed by the relative location of the key 2 x 4's. Two pieces of 1 x 1¼″ are used as lath backing but there can be no doubt as to their exact location.

A 5. All framing members are 2 x 4's.

A 6. All outside surfaces are to be lathed and plastered except areas taken up by table closet and drawers. The details show exactly what surfaces are to be plastered by the plaster symbol.

A 7. The table closet is 11⅛″ deep and 2′–1″ wide and 7′–0″ high. These dimensions are in the clear and do not include casing material which is ¾″ thick.

A 8. The table, an idea of the owner, can be folded up and put away when not in use. The table itself (as shown by section A–A Fig. 47) is of white pine and is 1′–10″ x 4′–0″. It is reinforced at both ends by a piece ¾ x 2″. It is 1″ thick. The one leg is hard wood and is to hinge to the under side of the stiffener so it will fold up against the bottom of the table when the table is put away. The table is hinged to the back of the casing so it will fold up as indicated by dotted lines on detail. The owner is to supply and install hinges.

A 9. The table is of special millwork and will be made by a mill upon builder's order.

A 10. Answered in A 8.

A 11. Over-all dimensions are 7'-8" and 12" (not counting lath and plaster).

A 12. The soil pipe location is not given because there is approximately 1'-6" x 7½" in which it can be placed. The plumbers are thus allowed this area whereby they can locate the pipe to their convenience.

A 13. The trim, as per specifications, is to be birch except in bedrooms where gum wood is to be used. All other trim will be birch and it is assumed that windows, doors, etc., will be trimmed in the usual manner. Around special details, such as the drawers (in special partition) and the table closet, the trim is indicated on the detail drawings. It will be noted that the word *trim* is shown in all such unusual places. A special group of drawings should show shape and size of all trim.

A 14. The general specifications call for a plaster board lath. There are no contrary notes on this group of details so it is assumed the same lathing will be used.

Note.—In framing it is customary to space studs 16" C to C because of standard plaster board width. But in the case of this special partition, the studs must be placed to accommodate the uses of the partition so the standard spacing cannot be accomplished.

A 15. The table closet door is not of standard size so it becomes special millwork. This door is detailed in Fig. 47 and called a "special door." It is ¾" thick at the stiles, 6'-11¼" high, and 2'-½" wide. The top rail and stiles are 3" wide and the bottom rail is 5" wide. It will be made of birch. The owner will furnish and install hardware.

A 16. The door is not of the usual kind and so becomes special millwork.

A 17. This register is left to the requirements of the heating design within the limits of the allotted space.

A 18. The hot air ducts are at the extreme end of the partition and each one can be as much as 12" long and 4" wide.

A 19. The drawers proper are 8⅞" wide and 10" deep. Their location is governed by the studs and no special dimensions for location are given because their position cannot vary. The only dimension that need be given for their location is the one for the first or lower drawer which is 12¾" above the floor as shown in section B–B.

A 20. The casing for the table closet is ¾ x 6" matched yellow pine which must be sanded.

A 21. The drawer area is cased by yellow pine that is tongued and grooved.

A 22. Yellow pine, as noted on sections A–A and B–B.

A 23. Notes at various places on the details specify that all hardware will be furnished and installed by the owner.

A 24. Electric outlets will be placed approximately where shown on details.

Problem 6—First Floor Framing. Framing is purely a design feature and for that reason will not be discussed. However, there are several details necessary for framing plans so we will discuss framing only from this standpoint.

Fig. 48 shows the first floor framing for the floor plan shown in Fig. 14. Also some of the typical details are shown. To simplify

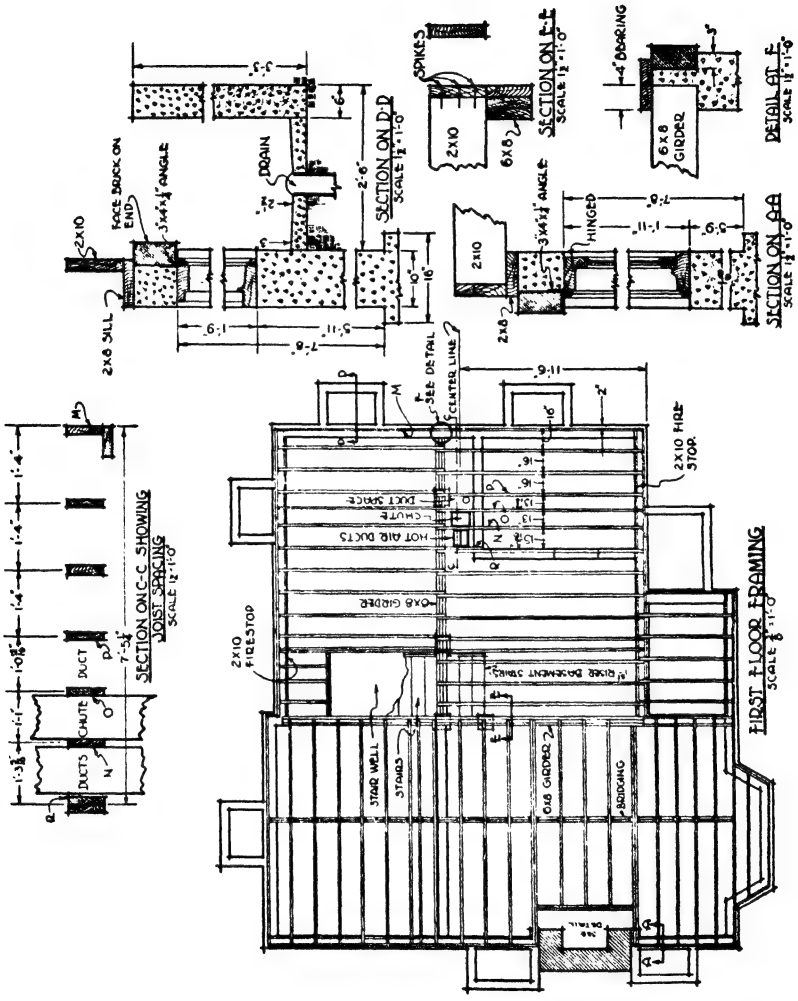


Fig. 48. First Floor and Basement Framing Details for Cox Residence

the framing plan, most dimensions have been omitted. The detailer becomes interested in this framing plan in order to illustrate the construction, dimensions, etc., for places not readily dimensioned on the plan.

As an example of this, some of the most common detail points are listed as follows:

(a) Framing under special partition as detailed in Fig. 47
(b) Framing over windows
(c) Framing over girders
(d) Girder bearing in foundations
(e) Area ways

Framing under the special partition comes under the head of detailing because of the special requirements due to hot air ducts, chute, and soil pipe. In Fig. 48 is indicated the spaces for hot air ducts, chute, etc. The detailing of the framing is calculated as follows. From Fig. 14 it can be seen that the center line of this special partition is 11′-8″ from the corner of the plan. This center line was first drawn on the plan before the joists were drawn in. The joists must be so spaced that the chute, etc., can pass through without interference. Joists are spaced according to the load on the floor and any partitions they must support. However, for this discussion it is enough to say that if the joists do not exceed 16″ spacing and are 2 x 10 the frame will be safe. The first joist to be placed forms a part of the sill. Referring to Fig. 46, we see this first joist will be 2″ back from the outside surface of the foundation. This joist is shown at M, Fig. 48. Next, it is best to locate and draw in to scale the ducts and chute, etc. Both the ducts and the chute are approximately 12″ wide so a joist must be placed in between them as 16″ is the maximum allowable spacing. This joist is shown at N, Fig. 48. Then another joist, O, is placed on the right-hand side of the chute. The next joist, P, is put at about the same spacing. The two remaining joists between P and M can be spaced as near 16″ as possible. The joist at the left of the two hot air ducts is placed a little beyond the duct ends to allow some play for duct size.

The exact dimensions are now to be calculated. From Fig. 47, the end of the special partition is shown to be 7′-6″ from the outside edge of the sheathing. On the framing plan no sheathing is in place so we can deduct ¾″ from 7′-6″ and assume that joist R will be 7′-5¼″ from the outside edge of joist M. In order to show these dimensions more clearly, a larger detail C-C is drawn to a scale of 1½″ = 1′-0″. Such a detail is indicated by the cutting line C-C shown on the plan. Joist R is drawn after joist M has been put in

place and the distance is 7′-5¼″ as shown. The space between joists R and N is determined, as previously stated, by the width of the ducts. The ducts are about 12″ wide but a little more space is allowed and the distance between R and N made 1′-3⅝″. Keep in mind that the *actual* size of joists are 1⅝″ thick instead of a full 2″. To arrive at the spacing between N and O, the actual size of the chute must be considered. This width being 11⅜″ we make the spacing 1′-1″ by adding half the width of two joists as shown in detail C-C. Joist P is spaced allowing enough room for the kitchen hot air duct. The remaining joists are spaced as near 16″ as possible. The sum of the joist spacing dimensions must be 7′-5¼″. The dimensions are shown on the framing plan.

The details for b, c, d, and e, (page 114) are indicated by the cutting lines shown on the plan at A-A, B-B, D-D, and E-E. In all cases cross sections have been drawn showing all parts in their proper position. The large scale was chosen in order to more clearly show all parts and their relative positions. The drawing of these details was done in much the same step by step method as explained for the joist spacing.

With the details drawn, we can now ask some of the typical questions about this framing plan (Fig. 48).

Q 1. What is sill construction?
Q 2. How are joists supported?
Q 3. What fire protection is used?
Q 4. What is joist spacing under special partition?
Q 5. What size joist is used?
Q 6. What is the construction around basement windows?
Q 7. What is the construction at E–E?
Q 8. How are girders set in the foundation for bearing?
Q 9. What is area way size around windows?
Q 10. What mix is used for area ways?
Q 11. How far above basement floor are basement windows?
Q 12. How are area ways drained?
Q 13. How are sizes for basement window openings determined?

The answers to some of the typical questions are as follows:

A 1. The sill construction is partially shown in sections A–A and D–D. A more detailed drawing can be found in Fig. 46, drawing A. A 2 x 8 is bolted down to the foundation flush with the inside edge of the foundation. A 2 x 10 is erected at the outer edge of the 2 x 8. Rough flooring follows.

A 2. The joists are supported by the foundation and by 6 x 8 girders.

A 3. Fire protection in the form of pieces of 2 x 10 nailed between joists is used. These pieces are parallel to the vertical member of the sill and have their inside faces flush with the inside face of the foundation. In this position they retard the progress of a fire in that the fire would first have to burn through them before gaining access to the hollow wall.

A 4. Starting from the joist at M the joist spacing is 16", 16", 16", 13 15/16", 13", and 15 5/16". This spacing must be accurately followed to avoid trouble.

A 5. From the details such as A–A it is seen that 2 x 10 joists are used. This information is given also in the written specifications and in usual cases where the framing plans are fully dimensioned it is shown on them.

A 6. The construction around the basement windows is shown in A–A and D–D. The "soldier" course of face bricks is supported by a 3 x 4 x ¼" angle iron. When pouring the foundations, a form is put in place equal in width and depth to the size of opening required by the window. Window sizes are given in the schedules in Fig. 29. The form is removed when the concrete has set and the window frame built in. The angle iron must be built in during the pouring. The angle iron is exactly 7'–8" above the footing. Top of form will be at the same height.

A 7. Detail E–E shows how the joists, which run in opposite directions, are supported by the girder. One joist is placed over the third joist of the girder. The girder is made of three 2 x 8's spiked together. The joists running in the opposite direction are allowed the width of two 2 x 8's for bearing. They are spiked as shown in detail.

A 8. Detail at F shows how the girders are set into the foundation for bearing. They are extended 4" into the foundation and must be held in place prior to the pouring of the concrete.

A 9. Detail D–D shows that the area way is 2'–0" wide in the clear and that it is 3'–0" deep in the clear. The area way walls are 6" thick, of concrete, and extend up to grade level. The floor is approximately 3" thick. The length of area way is given in Fig. 29.

A 10. If no mix is specified on drawings, then the same as used for foundations is assumed. This information is also given in written specifications.

A 11. The basement windows are shown by the 7'–8" dimension (Details A–A and D–D) to have their tops of frame 7'–8" above the footing.

A 12. The area ways are drained by a 4" cast-iron pipe located in the center of each area. The area floor gently slopes toward the drain.

A 13. From schedule in Fig. 29 and from details A–A and D–D. Where air conditioning and heating by hot air is to be a part of a structure, the designer must make provisions in the frame, partitions, etc., for the necessary duct space. Thus detailing becomes closely allied with air conditioning and heating in general.

Problem 7—Arch in Living Room. Arches come under the classification of designing only so far as their shape is concerned. Beyond that point they are purely the detailer's job.

Note the arch between the living room and hall in Fig. 14. Only the width and sometimes the height and shape can be given on the plans. The construction must therefore be detailed. In detailing an arch two points must be kept in mind, namely, construction of the arch and the framing over the arch to take the load. Note Fig. 49 on which the detail of the living room-hall arch will be found. The detailer generally draws in the rough flooring first and then puts in the plate or sill. Next, he ascertains the width of the opening and puts in the double 2 x 4's on both sides so that the span of the arch will be equal to the required width plus thickness of plastering, and trim in event of a cased opening. The width was made to a definite size so as to use a number 44 Gothic Red Top metal lath which is purchased ready to install. These arches are of metal having holes at frequent intervals so as to provide keying for plaster. They are ordered by catalogue number from standard catalogues. Many sizes are available. Where they are to be used, the opening must be controlled to the size selected.

The height of the arch is next determined so that the position of the two 2 x 4's on edge can be calculated. Knowing the height of the opening, the detailer can measure this distance from the floor to a point M allowing for thickness of finished flooring and plaster. The metal arch symbol is then drawn in. Over a span of this amount (approximately 4 feet) some bracing must be done above to carry the floor load over the opening. Note examples of framing over openings in Plate XII. The bracing shown in Fig. 49 is typical for a narrow opening with a light load. In cases of wider openings and heavier loads, more bracing is shown and heavier members shown in place of the two 2 x 4's on edge. To give the detail a finished appearance, the top plate, joists, and flooring are shown. The 1″ = 1′-0″ scale was selected so that 2 x 4's, flooring, etc., could be clearly shown.

The necessary dimensions and specifications are those shown. With these dimensions the builder has all he needs in the way of information.

Below are some typical questions that must be answered by details.

Q 1. What is the height of the arch?

Q 2. What arch construction is shown or required?
Q 3. What is the width without plaster?
Q 4. Is the arch to be plastered or cased?
Q 5. What is the framing like?

These questions are answered from the detail as follows—

A 1. The height of the arch M is given as 7'-8½" by the dimension at the left. This height is not considering finish flooring or plastering. It is always best to supply builders with dimensions in this manner.
A 2. The arch is greatly simplified by the specification calling for a ready-built metal arch which can be purchased at any material supply house by its number.
A 3. The width is shown to be 4'-6".
A 4. The arch is to be plastered. This is evident because of the use of the metal arch in which it would be impossible to nail if finishing by lumber was indicated.
A 5. The framing is clearly indicated. It shows the double studs around the sides of the opening, double 2 x 4's forming the top, short studs and diagonal bracing above the arch, and ordinary joist construction for the second floor. These details govern completely the construction and layout of the arch.

Problem 8—Stair Framing. Stair framing, which includes the adjacent framing, is perhaps the most difficult part of an ordinary structure. More errors occur at this point than at any other. The designer and detailer alike can well afford to take special care where stairways are concerned. Stairways must be considered not only in the light of accurate construction but for convenience, safety, and beauty as well.

In building to eliminate accidents or hazards, special consideration should be given to the construction of the stairs, because of the high rate of accidents that occur on stairs. A table of safety standards indicates that there are a number of desirable dimensions for risers and treads. The most satisfactory values, however, are 6¾ to 7 inches for the riser and 10½ to 10¾ inches for the tread. Slight variations are permissible but in all cases the sum of the tread and riser should equal 17½ inches, exclusive of nosing. The nosing is that part of the tread that extends beyond the riser. The angle with the horizontal should be between 30 and 36 degrees. See "Safety Standards" at the top left in Fig. 49. A nosing of about 1 inch is desirable. These dimensions which have proved the safest for large numbers of people may well be used as a pattern for the building of safer stairs.

The general safety standards for stair construction are as follows:

1. Stairs should be free from winders as much as possible.
2. The dimensions of landing should be equal to or greater than the width of stairway.
3. Landings should be level and free from intermediate steps between the main up flight and the main down flight.
4. All treads should be equal and all risers equal in any one flight.
5. The sum of one tread and one riser, exclusive of nosing, should not be more than 18 inches nor less than 17 inches.
6. The nosing should not exceed 1¾ inches.
7. All stairs should be equipped with substantial handrails 36 inches in height from the center of the tread.
8. All handrails should have rounded corners and a surface that is smooth and free from splinters.
9. The angle of stairs with the horizontal should not be more than 50° nor less than 20°.
10. Stair treads should be slip-proof with no protruding nails or bolts.
11. The color of risers and treads should differ as an aid to visibility.
12. When stair rail passes stringer course, the clearance should at least be 3 inches.
13. No stairway should exceed 12 feet in height without an intermediate landing.
14. Stairs should be at least 3 feet wide.
15. Stairs should have ample natural or artificial light.
16. Electric lights for stairways should be controlled at both top and bottom.

The following table and the figure "Safety Standards" in Fig. 49, help both the designer and detailer.

In practically every case the stair parts such as treads, risers, etc., are made at the mill. When stringers and all framing are in place, such as in Fig. 50, the mill comes on the job and takes its own dimensions and makes up the material. Therefore, it is not necessary for the detailer to make drawings for such parts other than possibly to indicate results desired. This becomes more of a design job. However, the detailer must know the stairs and be able to draw the framing details accurately. Any stairway, unless most simple and the builder is allowed his own judgment, will require some detailing so as to control the framing and show necessary dimensions so that the stairs when completed will be as desired.

To clearly picture such a problem, we will study Figs. 14 and 30 as far as the stairway, its supports, and partitions are concerned. The first floor plans show 8-inch partitions on either side of the

TABLE OF RISERS AND TREADS FOR STAIRS

Tread + Riser = 17½″

Angle With Horizontal	Riser in Inches	Tread in Inches	
20°-00′	5	12½	
23°-14′	5¼	12¼	
24°-38′	5½	12	
26°-00′	5¾	11¾	
27°-33′	6	11½	
29°-03′	6¼	11¼	
30°-35′	6½	11	
32°-08′	6¾	10¾	Preferred
33°-41′	7	10½	
35°-16′	7¼	10¼	
36°-52′	7½	10	
38°-29′	7¾	9¾	
40°-08′	8	9½	
41°-44′	8¼	9¼	
43°-22′	8½	9	
45°-00′	8¾	8¾	
46°-38′	9	8½	
48°-16′	9¼	8¼	
49°-54′	9½	8	

lower flight. The designer felt that the added strength of an 8-inch wall would be worth while.

Fig. 30 shows a platform and also a balcony outside presumably at the same level. A short second flight is indicated. The framing then must support both flights, the platform, the balcony, and at the same time provide ample space for the doors leading into the sunroom, basement, kitchen, outside, and allow headroom in the kitchen under the second flight. Studs, plates, sills, and the standard

spacing must be followed as closely as possible. Two heating ducts must be allowed room at the indicated places. The second floor joists must be carefully shown as to their supports. The balcony joists must be properly supported as no outside supports other than two brackets are indicated on the elevation drawings. The stringers must be detailed so they will be ready for the stairs.

In this text the explanation will be a general one such as can be applied to all detailing of a like kind.

With the above things in mind concerning what the details must show, the student is urged to study very carefully Figs. 14, 30, 49, and 50. Fig. 49 shows the section and plan of the stairway framing. Fig. 50 has been made to pictorially show the framing in its correct position. In both Figs. 49 and 50 the various parts have been numbered and the meaning of the numbers shown in the legend in Fig. 50. The student should note numbers on Fig. 50 and then find the same numbers on Fig. 49 so as to obtain a clear understanding of the complete frame and be able to see in his mind's eye, how this framing fits the plans around the stairway shown in Figs. 14 and 30. It should be explained that in Fig. 50 many items of the framing have been cut away in order to better show other parts. Wherever the end of a part is shown cross hatched, that means it has been cut away to show other parts. For example, note pieces 13 and 14 in Fig. 50. These 4 x 8's have been cut away in order to show the stringers numbered 3. Also stringer number 1 has been cut partly away to show the duct at 29. These drawings may appear confusing at first glance but a careful study of them all will bring about a clear picture of the framing.

The layout of the stairway framing including the stringers often has to be done by the detailer. With the tread and riser dimensions known, the type of stairway decided upon, and the location of the stairway fixed, the layout can be carried forward as follows—

The plans in Figs. 14 and 30 show a stairway with a landing. The height of the landing above the first floor is determined by the number of risers in the first flight of steps. See dimension P in the section of stairway framing, Fig. 49. Such a drawing as this, accurately to scale, can be drawn by first putting in the floor levels at R and O. The width of the landing should be determined by the designer. The position of the first flight should be shown as well

as the approximate position of the first riser at LJ. This much information should come from the design of the floor plans. The

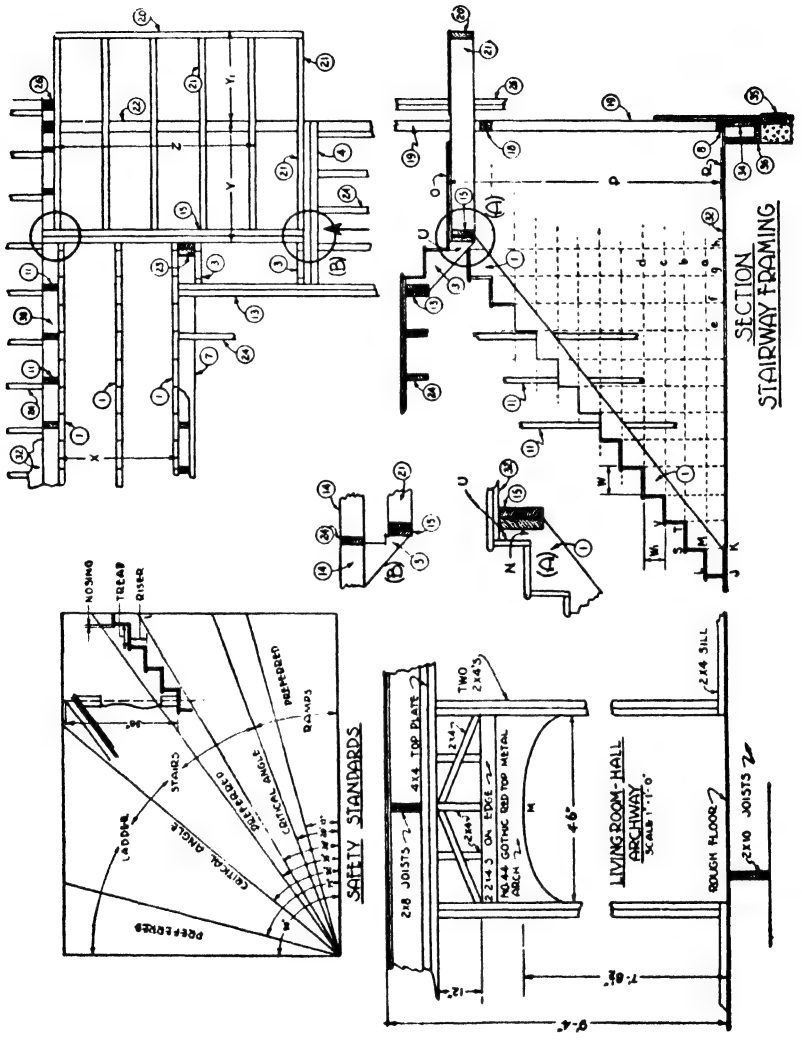


Fig. 49. Arch and Stairway Framing Details for Cox Residence

stringer at 1 can now be designed. Draw light or dotted lines such as a, b, c, d, etc., starting at a, which is the distance of one riser above floor, and continuing lines b, c, and d, etc., at the same spacing. Distance MK is the riser height and distances ab, cd, etc., should

all be the same. Then starting at LJ draw vertical lines at a spacing of LM which is the tread width. Continue these vertical lines

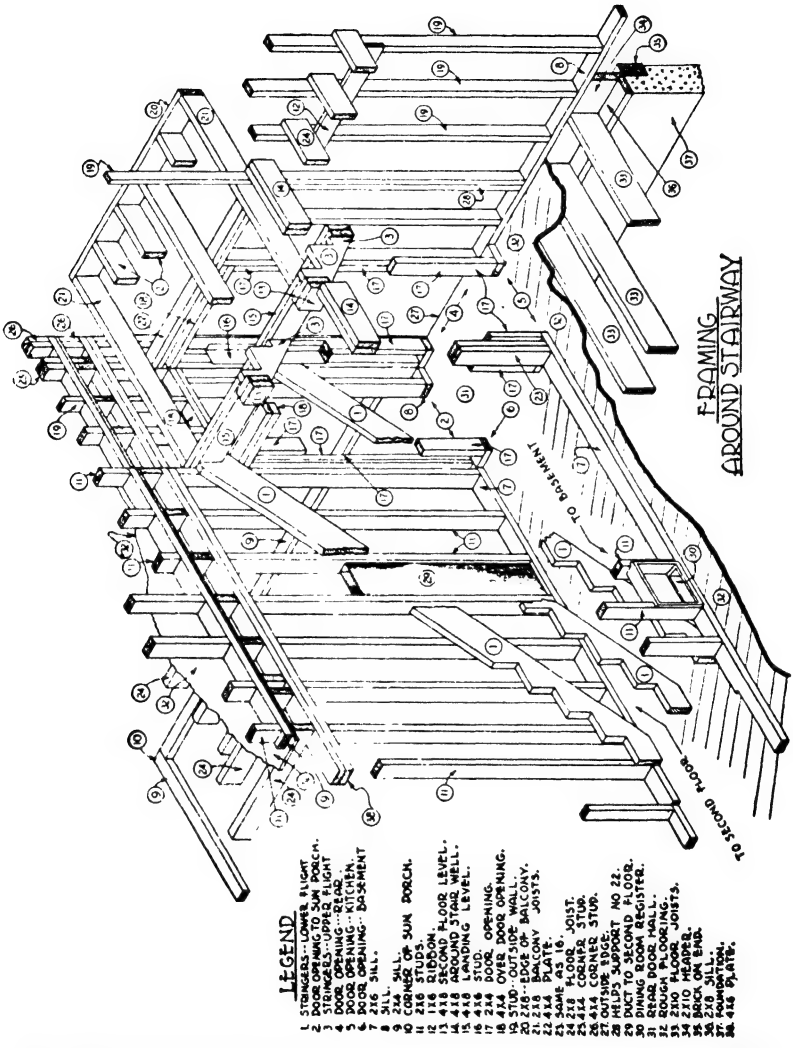


Fig. 50. Isometric Sketch Showing Pictorially the Framing for Stairway in Fig. 49 (The Legend on this Figure refers to Fig. 49)

such as e, f, g, h, etc. Then LJ is the first riser and LM is the first tread. Then MS, ST, and TV can be drawn and the balance of treads and risers draw in. If this is accurately done, the last riser

at V will allow a distance N between it and the 4 x 8 at 15. The last riser U should include the floor thickness as shown in the enlarged drawing of the circle at A. The second flight of the stairway is done in like manner after which the 4 x 8 at 13 can be placed.

The student will note that the positions of many framing members such as 15, 13, 14, etc., depend upon the accurate location of the stairs. At this point the dimensions that give exact positions of framing members such as 15 and 13 can be drawn in. All locating dimensions can be shown in the section and plan in Fig. 49.

The following are some of the questions which a builder might ask after looking at Figs. 14 and 30.

Q 1. How far apart are the 2 x 6 studs on either side of the first flight?
Q 2. What is the framing dimensions for the landing?
Q 3. How is the balcony to be supported?
Q 4. What are framing dimensions for the balcony?
Q 5. How is the framing for the second flight supported?
Q 6. How is the first flight stringer supported?
Q 7. How is the member framing around second floor opening supported?
Q 8. How are joists for landing and balcony supported?
Q 9. How many stringers are needed for each flight?
Q 10. How many risers are there in each flight?
Q 11. Is there a solid partition between flights?
Q 12. What are riser and tread dimensions for cuts in stringer?

These typical questions can be answered as follows:

A 1. The 2 x 6's are placed to allow a width of dimension X on plan of stairway as shown in Fig. 49.
A 2. The dimensions for framing on the landing are Y and Z.
A 3. The balcony is supported by nailing the joists to the 4 x 8 at 15 and by the 4 x 4 at 22. These joists form the landing and being cantilevered form the balcony.
A 4. The framing dimensions are Z and Y1.
A 5. The stringers or framing for the second flight are supported by the 4 x 8's at 15 and 13.
A 6. The first flight stringers are held up by the 4 x 8 at 15 as shown in enlarged detail at A in drawings.
A 7. The framing for the second floor opening is supported by members 13 and 14 which are double joists having bearing on the partition between flights and on outside wall plates.
A 8. The balcony and landing joists are supported by the 4 x 8 at 15 and the 4 x 4 at 22.
A 9. Three.
A 10. Thirteen in the first and two in the second.
A 11. Yes. The studs are under member 7 as shown in plan view of stairway in Fig. 49.
A 12. The dimensions are shown in the section drawing to be W and W1.

Problem 9—Fireplace and Chimney. The fireplace shown in these details is somewhat different than shown in Fig. 14. Dimensions and shape vary for reasons of better and clearer explanation. However, the principle back of all fireplace detailing is the same.

Detailing for fireplaces can be made a highly complicated job if all parts of the fireplace and chimney are to be shown in detail. Generally, only the more important or unusual design features are detailed, because masons engaged in fireplace construction know how to build the ordinary types if governing dimensions are supplied. Also there are concerns making fireplaces and fireplace equipment where materials, parts, etc., can be purchased. In all cases it is safe to show at least a few details and absolutely necessary if the design is unusual or the construction to be kept within definite specifications.

Fireplaces and chimneys are in most cases made of brick masonry which can be trimmed or faced with rubble or flag stone. The part of the chimney below hearth level can be made of concrete, thus making the whole chimney base an integral part of the foundation. Flues should be lined. Flue lining can be specified in rectangular or circular shapes ranging from 8½ x 13″ and 10″ diameter, up to 20 x 24″ and 22″ diameter. The size of flue to use depends on the width and height of the finished opening of the fireplace. A simple rule is that flues should be 1/10 of fireplace opening and never less than 70 square inches in cross-sectional area. For coal burning boilers, etc., the size must be calculated by the engineers who design the heating system, because any mistake at this point will seriously impede the action of the system.

Throats and dampers for fireplaces vary in size according to fireplace size. Catalogues of all such apparatus can be secured from manufacturers.

Fireplaces differ widely in design, shape, etc. However, the general principle is the same except in cases where room heating is combined with the fireplace and in such cases the details would be supplied by the manufacturer. The designing of fireplaces can not be considered in this book. Only the methods of detailing will be described.

There are, however, a few basic principles which the detailer

must be acquainted with. A few of the most important are listed below.

(1) There should be two inches of non-combustible material between the fireplace or chimney and all wood structural parts.
(2) In case where plastering must be put on fireplace or chimney, metal lath should be used.
(3) Where headers are parallel to rear wall of fireplace, allow four inches for firestopping.
(4) In cases where the required space cannot be allowed between chimney and any wood parts, there should be at least an asbestos board or sheet used.
(5) If a flue is lined, there need be only 4" of brick masonry between the flue and outside edge of chimney.
(6) If a flue is not lined, 8 inches should be allowed.
(7) Where flues are not lined, there must be 4 inches between adjacent flues.
(8) Lined flues can have their lining back to back so long as lining joints do not meet.
(9) Do not corbel chimneys more than an angle of 30°, or ⅝ width of chimney below.
(10) Top of chimney pots must be equal in area to flue.
(11) Flue lining should extend above top of chimney at least four inches.
(12) Chimney in pitched roofs must be at least 2 feet above ridge and 3 feet above a flat roof.
(13) Fireplaces should have a minimum of 4 inches for firebrick thickness.
(14) Part in isometric, Fig. 51, shown at A must be at least 4 inches thick.
(15) Part A, in specification 14, should be at least 8" high.
(16) Minimum width at damper is 4 inches.
(17) Where the trimmer arch is not used, the under part of the hearth should be 4 to 6 inches of concrete reinforced by ½" bars spaced 6 inches in center.
(18) Throat area must always be more than flue area.
(19) No wood trim should be nearer than 6" to edge of fireplace opening.
(20) Round flues have a greater effective area per cross section than square or rectangular shaped flues.

Figs. 14, 30, and 29 all show the proper fireplace symbols. Here the general shape of the chimney, number of flues, and plan designs can be seen. But no details are shown, therefore detailed drawings are necessary. In general, the details required will be a plan of all parts, an elevation, details of flues, framing around chimney, material specifications, damper specification, hearth dimensions and design, and any other information that obviously is necessary. The 1" = 1'-0" scale seems large enough and we will start with a plan view.

Before going ahead with the actual detailing, the student should

refer to Fig. 51 and study the conventional drawings, namely, plan, elevation, flue plan, etc., noting the names of the various parts. With

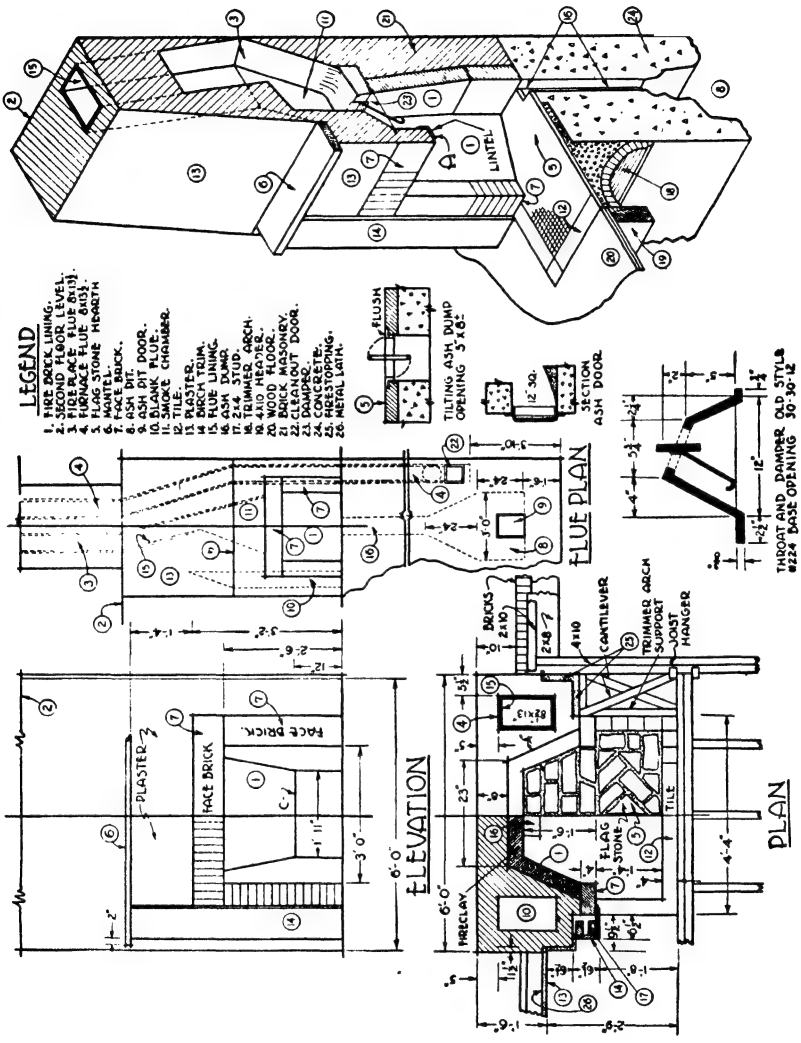


Fig. 51. Fireplace Details for Cox Residence

these parts all in mind, notice the isometric to right of Legend to see these parts in a more realistic manner. This isometric shows what can be called a picture of the main fireplace parts. A careful study of conventional and isometric drawings will make clear the

construction. The isometric is shown in cross section. This section was taken at the center line shown in plan, elevation, and flue plan drawings.

The plan view should be accurately drawn to scale showing one side rough (right side in Fig. 51) and one side finished (left side in Fig. 51) showing trim plaster, etc. One side of hearth should be drawn in showing design and construction. Flues should be placed. All dimensions are then drawn in. The framing around the hearth must be indicated and such items as joists and hangers specified. The cantilever construction is indicated. Care should be taken to follow rules as given on page 126.

The elevation is drawn in much the same manner showing one side complete (left) and one side rough (right). The height of C above the floor line or hearth should be 12″ or not more than half of the 2′-6″ distance. The rear bottom or back of the fireplace should be about two-thirds of the total opening.

The flue plan is to show locations of all flues and give their slants in cases such as this one where the chimney size diminishes above second floor level. To make the details even more complete, a cross section of the chimney at each dimension such as between first and second floors, and second floor and attic floor, etc., can be shown together with dimensions following carefully the rules on page 126. A blank flue, while not necessary, does save material.

Details such as those for throat and damper and clean out door can be shown together with specifications and catalogue numbers. A cross section of the entire chimney from top to bottom aids in showing dimensions, corbeling, etc.

Now we can ask some of the questions about this fireplace that would be asked when seeing only the plans such as those shown in Fig. 14.

Q 1. What is width of opening?
Q 2. What is height and depth of fireplace?
Q 3. What fire resisting lining is used to line the fireplace?
Q 4. Is there to be a hearth?
Q 5. What material is used on surface of hearth?
Q 6. Are there two flues below fireplace?
Q 7. What is the flue size, and is it to be lined?
Q 8. What fire prevention means are to be employed?
Q 9. How is the fireplace to be trimmed?
Q 10. Is there to be a mantel?

Q 11. Fig. 48, framing plan, refers to details for framing around fireplace and chimney. What is the framing like?
Q 12. Fig. 28 shows decreases in chimney size. Where do these take place and what are the sizes?
Q 13. How far beyond outside wall does chimney extend?
Q 14. Where and what are the chimney details as regards shape and dimensions?
Q 15. What kind of a damper is to be used?
Q 16. What kind of an ash dump is to be used?
Q 17. How are ashes removed?
Q 18. How is hearth to be supported?
Q 19. What materials are used for the chimney?
Q 20. Will firestopping be used?
Q 21. What is size of throat?
Q 22. How is outside of chimney to be trimmed?

The following are the answers, as found in the detail drawings.

A 1. The width of the opening is found in Fig. 51 on the elevation and is 3'–0".
A 2. The height is shown on the elevation to be 2'–6", and the depth is shown on the plan to be 1'–6".
A 3. The fire resisting lining is fire clay bricks as indicated on the plan.
A 4. Yes, the plan shows a hearth which is 4'–4" wide and has a depth of 1'–8".
A 5. The hearth is to be surfaced with flag stones.
A 6. No. One flue is for the furnace. The other opening having no lining is a blank flue and is shown on both plan and flue plan.
A 7. The flue size is 8½ x 13" and is to be lined. This information is shown on the plan.
A 8. The usual rules have been followed (see page 126) and non-combustible material indicated. See 25 on plan, shown in Fig. 51.
A 9. The fireplace opening is to be trimmed with face brick. The unit as a whole is trimmed with birch casings (see plan and elevation). The birch trim is shown at 14.
A 10. Yes, a mantel is shown on the elevation 1'–4" above brick trim.
A 11. The plan shows the framing to be doubled 2 x 10's supported with the aid of a joist hanger and a cantilever at the corners.
A 12. The chimney decreases in size at the second floor level and again above the attic floor level. The vertical dimensions are shown in Fig. 28. The cross-sectional sizes, while not shown in Fig. 51 in order to simplify the drawing, should be shown or specified on drawings in actual practice.
A 13. The plan shows the chimney to extend 10" beyond the outside surface of the outside wall.
A 14. As explained in answer 12, these dimensions should in actual practice be shown on elevations and detail drawings. They should include a dimension giving top of chimney.
A 15. The damper is detailed and specified. It is "Old Style Number 224." The various dimensions are given to aid the masons in constructing the masonry background for the damper.

A 16. The ash dump is detailed and specified as 12" square.
A 17. The flue plan shows an ash pit 3'–0" wide, 24" deep, and having a slanting approach.
A 18. The hearth is supported by a trimmer arch as specified on the plan.
A 19. Above the hearth, the chimney is brick. Below, concrete.
A 20. Yes. fire stopping is indicated on plan by dots at 25.
A 21. The throat must be as specified on damper detail.
A 22. Trimmed with rubble as per Fig. 28.

Problem 10—Balcony. Fig. 23 shows the whole elevation of the balcony. Not a great deal can be learned about its construction from either this elevation or the plan shown in Fig. 14. Therefore details are necessary.

Before discussing the balcony the second floor framing will be explained but only so far as would interest the detailer. The designer must calculate joist size and allowable spacing. In such a problem the designer may as well draw the details because no details can be drawn until joist size and maximum spacing are decided upon. The detailer is interested in such items as the framing under the special partition (see Fig. 30), the framing for stair platform and balcony duct locations, and clothes chute.

The locations for ducts at O, R, and S (Fig. 52) would be detailed if the heating system was being designed by the architect. Special dimensions are needed to locate these ducts to insure the proper spacing of joists around them and to aid the sheet metal contractor making and installing them. The clothes chute P requires that joist spacing be correct, so here would be required special dimensions, also joists are located as explained in Problem 6. This explanation applies where the spacing of joists at a, b, c, d, e, f, g, h, i, j, k, etc., are concerned.

The framing is shown only to help illustrate the detailer's job so no dimensions are given. However, it is well that the student study especially the parts of this framing having to do with the stairway, platform, and balcony. This study should be done by using Figures 49 and 50. For example note that V, in Fig. 52, is the same as 26 in Figs. 49 and 50 that U in Fig. 52 is the same as 15 in Figs. 49 and 50, that T, in Fig. 52, is the same as point B in Fig. 49, etc. The point M in Fig. 52 is the double joists at the foot of the stairs, L is double framing under a partition, and it should be noted that again we show double framing around all openings.

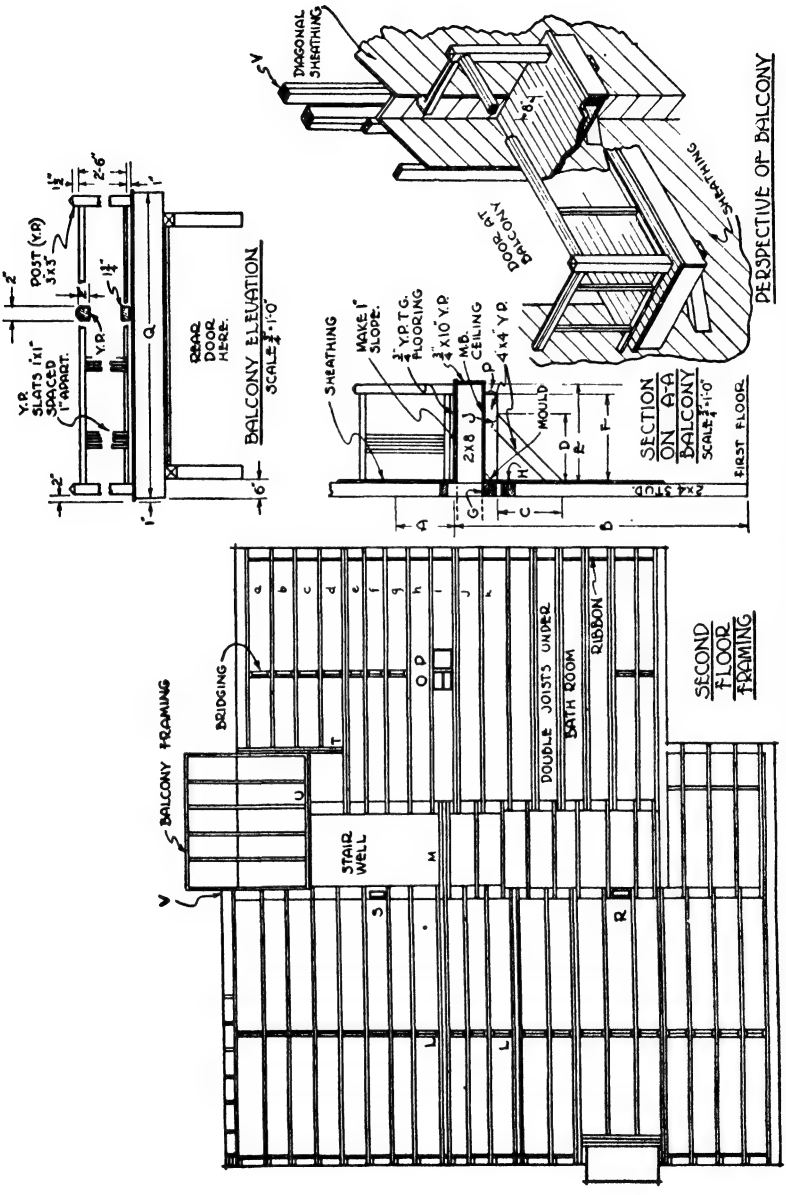


Fig. 52. Second Floor and Balcony Details for Cox Residence

The balcony details are also shown in Fig. 52 being composed of a section and elevation. The perspective view is not a necessary detail drawing and is shown here only to help the student form a perfect mental picture of the balcony.

The section and elevation were chosen as details because they can be made to show all the necessary information. The ¾-inch scale was chosen to more clearly show some of the smaller details, such as the moulding, hand rail shape, etc.

Before a detailer can begin his drawings, it is necessary that he have a perfect mental picture of the part of the structure he is concerned with. The perspective in Fig. 52 might be called such a mental picture. A comparison between it and the details will show that the details specify each part. With practice the beginner will be able to form mental pictures with ease.

From his mental picture, or if necessary, a rough perspective sketch, a detailer can determine what details will be necessary. In this case an elevation shows the assembly and allows placing of many dimensions. A section shows sizes, shapes, etc. The elevation can be drawn first accurately to scale in which all parts are shown in proper positions. Here also can be shown the size and shapes of railing members along with dimensions. The section is next drawn showing a part of the outside wall of the main structure and indicating joist construction. Such dimensions as A, B, C, D, E, F, and Q are calculated and shown. Material sizes and specifications can be given such as the ceiling, floor, etc. The student should note that letter G, on the section, is the same as 22 in Fig. 50. Also that H, in Fig. 52, is the same as 18 in Fig. 50.

Below are some typical questions that a contractor would find answers to in the details.

Q 1. How far above first floor is the balcony floor?
Q 2. Fig. 23 shows some sort of brackets. How are these constructed and what material is used?
Q 3. How is the railing made and what material is used?
Q 4. How is the balcony trimmed?
Q 5. What is the length and width?
Q 6. What type of flooring is used?
Q 7. How is the under side finished and of what material?

These questions are answered by the details—

A 1. The dimension B gives the height. This dimension should be so calculated to put the floor slightly below the floor level of the stair platform so that rain cannot seep in.

A 2. The elevation shows two brackets. The section shows that they are composed of 4 x 4 yellow pine, that the horizontal member is F dimension long, that the diagonal member is notched in at a point D dimension from the rear, and that the diagonal piece is nailed to the sheathing at a point C dimension below the horizontal piece. The dotted lines indicate the type of joint required at J. At P is the symbol which shows that the ends of the 4 x 4's are to be slightly beveled on four sides. This is also shown on the elevation.

A 3. The height of the railing is given as 2'-6". The hand rail is 2 x 2 with two beveled edges. The lower rail is 2 x 1¾". The slats are 1 x 1" spaced 1" apart. The hand rail is 1½" below tops of corner posts and the bottom rail 1" above the floor. The material is all yellow pine. The corner posts are 3 x 3" with beveled tops.

A 4. The only trim is the ¾ x 10" and the moulding. The shape of both are given.

A 5. The dimension Q gives the length and dimension E the width. The flooring extends out 1" all around.

A 6. The flooring is ¾" yellow pine of tongued and grooved stock. No width is given but the scale indicates 3".

A 7. The under side is finished MB ceiling.

Problem 11—Special Partition on Second Floor. Fig. 30 shows another special type of a partition between the bathroom and the third bedroom. Obviously no details can be shown in Fig. 30. Therefore, a builder or contractor or anyone else interested in learning the actual details of this partition would look elsewhere for more detailed drawing.

Figs. 53 and 54 show the necessary details. In Fig. 53 is the plan and elevation views. The elevation is seen from the bathroom side as indicated by the arrow at A. The elevation is not an absolutely necessary drawing and, although elevations can be used, it is used here more to help the student get a mental picture of the partition.

As stated before, it is necessary that the detailer have a complete mental picture of any unit of construction before detail drawings can be made. In some cases an incomplete picture is helped to completion by rough sketches and even inaccurate drawings. As an example of this the framing of this special partition could have been developed as the cupboards, etc., were placed. In detailing standard lumber sizes, trim sizes, etc., must be kept constantly in mind. The elevation in Fig. 53 could not all be shown

due to the size of the plate so the cut-out symbol was used. A large scale was chosen, like the one in Fig. 47, to more clearly show

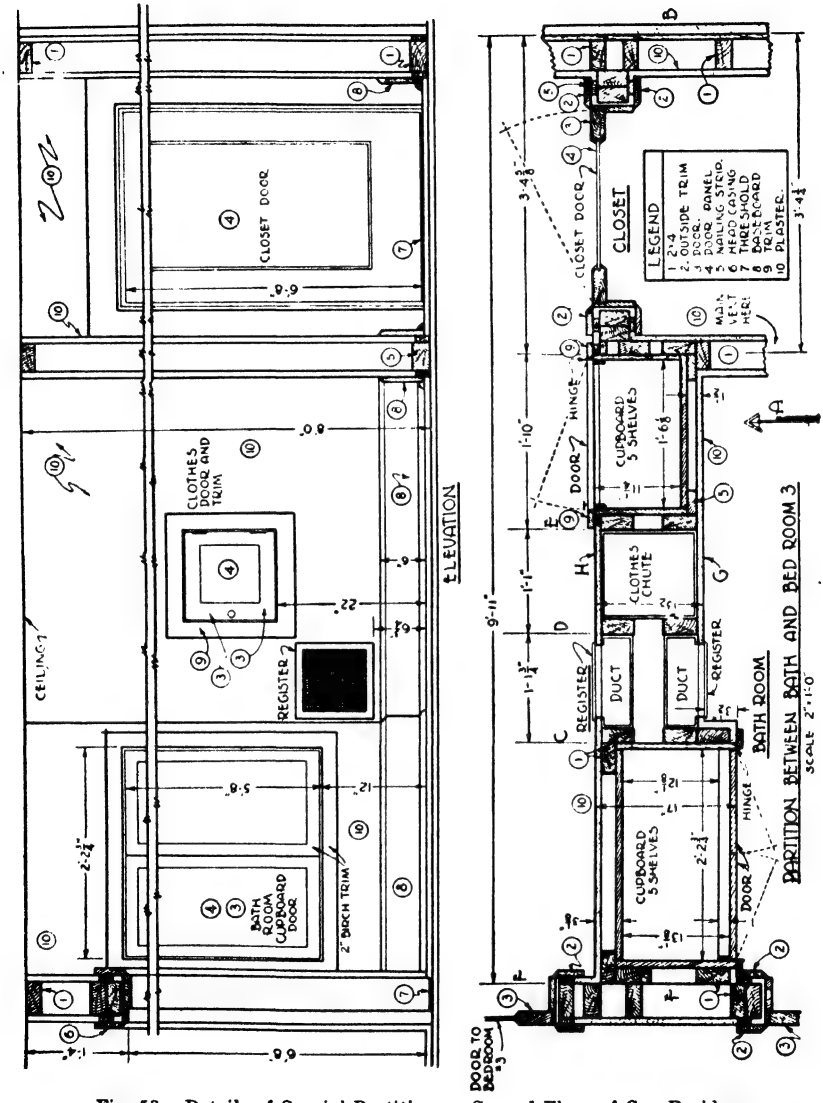


Fig. 53. Details of Special Partition on Second Floor of Cox Residence

all parts and allow easy dimensioning and symbol illustration.

From the owner or designer a complete picture of what this partition must contain can be secured. We assume here that we

know that a bathroom cupboard, a bedroom cupboard, registers, and clothes chute must be included. We know that the ducts and

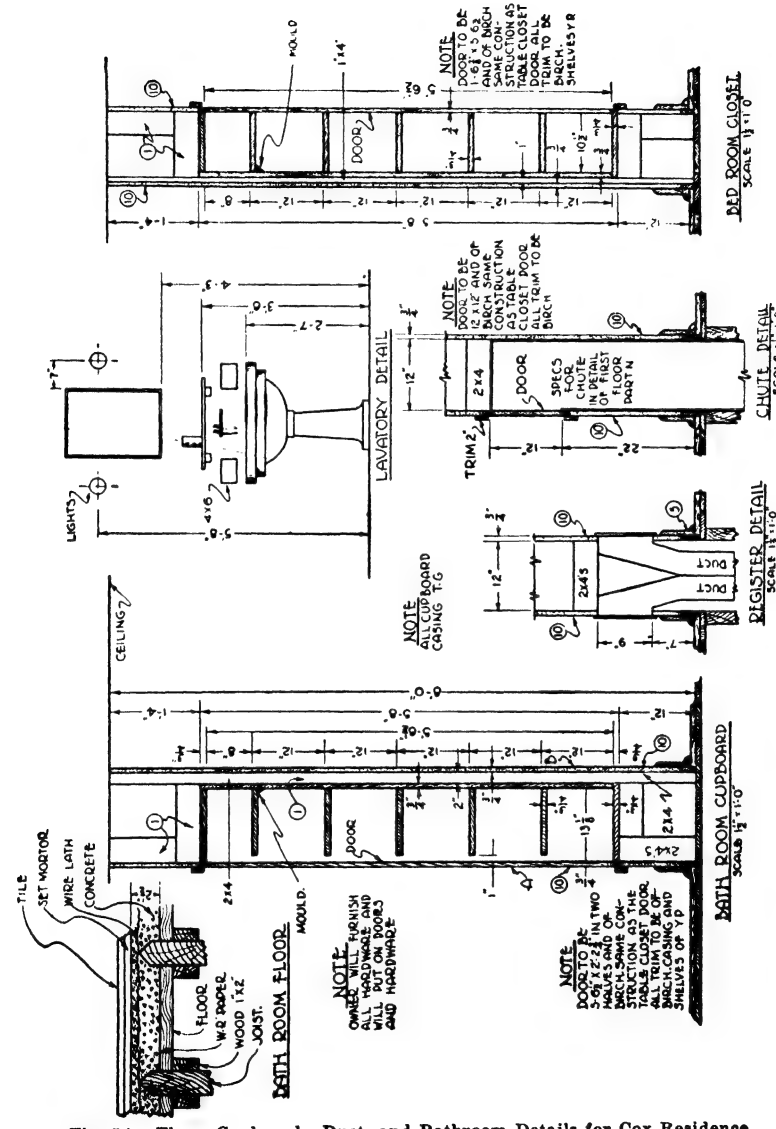


Fig. 54. Floor, Cupboards, Duct, and Bathroom Details for Cox Residence

clothes chute must come up vertically from Fig. 47. So, lay out the outside wall starting at B and measure the distance to the left

to locate positions of ducts and chute. This is accomplished by locating points C, D, and E. Next, locate the end of the partition at F. Fig. 30 shows the partition is 10′-2″ long as indicated by the dimension in bedroom 3. This 10′-3″ dimension starts at the outer surface of the wall, and continues to the center line of the partition forming the left wall of bathroom and bedroom No. 3. We deduct 4″ from 10′-3″ because we want only the actual length of the special partition. Thus the dimension becomes 9′-11″, as shown in Fig. 53.

Having already located the ducts and chute they can be marked by lines at C, D, and E. The next thing to determine is the center line, from B to F, of the special partition. Fig. 30 shows this to be 3′-2″ + 2′-11″ + 5′-9″ from the corner of the house. Now, draw a center line from B to F. The outside edges of the plaster can now be drawn by lines such as at G and H.

Next, consider the door leading into the closet, as shown in Fig. 30, to be size Q which according to the door schedule is a door 2′-0″ wide. The door must be framed on either side as shown in Fig. 53. The framing is made the minimum size according to standard millwork and 2 x 4's. Now, that the door, ducts, and chute are located, the remainder of the space can be used for the two cupboards. The size of both are already specified because the bedroom closet must go between the chute and door, which are already located, and the bathroom cupboard must go between F and the ducts. The small cupboard for the bedroom was made slightly larger by using 1 x 4″ pieces instead of 2 x 4's. This can be done in places where other 2 x 4's are in place near by. The large cupboard was made larger, so as to give at least a 12″ shelf, by building it out from the wall slightly.

From this point on, the detailing consists of calculating dimensions after all the 2 x 4's have been placed to provide plaster backing, strength, and means of fastening ducts, chutes, etc. The student should carefully study this framing.

The elevation in Fig. 53 is drawn to the same scale. The points for the doors, etc., were projected up from the plan. The height above the floor is determined by appearances, mechanical needs, and convenience in using.

In dimensioning the plan, the dimensions were drawn so as to

accurately locate the points where ducts, chute, etc., come in the partition so that any of these parts could be partially put in before the framing. Sizes of cupboards, etc., should be given as well as dimensions giving length and width of partition. The 2 x 4's are known dimensions.

The actual details, in Fig. 54, are drawn to supply dimensions that cannot be shown on the plan and to supply other information as well. In this partition we have two cupboards, ducts, and a clothes chute. Therefore a cross section of each is necessary together with any other information possible.

For example, note the bathroom cupboard. First, close the scale. It should be large. Now imagine a cutting plane cutting through the partition at right angles to it and through the middle of the cupboard. Imagine you can actually see the cut portion and draw what you see. Note detail of bathroom cupboard in Fig. 54. The width of the detail or cross section will be the thickness of the partition. Thus lines at A and B, Fig. 54, can be drawn. Then indicate the plaster thickness and the 2 x 4. (Circled numbers mean the same as in Fig. 53.) Then the first shelf at 12″ above follows. The casing of the cupboard is indicated. The 2 x 4 framing at top and bottom of the cupboard is shown. The cupboard door is shown in the proper place and the trim drawn in. Then full dimensions showing location of cupboard, depth, height, shelf spacing. shelf width, all material thicknesses, ceiling height, etc., are drawn in. Care should be taken to show any needed dimension. Around the detail, baseboards and other trim should be drawn in. Various specifications can then be given by notes. Symbols indicate materials.

The bedroom closet is drawn in the same manner and as much like the first one as possible in order to bring about economies.

In drawing the details for ducts and chute, the same procedure is followed. The height above the floor is shown, size of openings, specifications, etc., as shown in Fig. 54.

The details are all carefully described by titles. The student will learn a great deal by a careful study of these details.

Also in Fig. 54 are shown a detail for the tile floor and an assembly drawing for part of the bathroom fixtures. The floor detail, to a large scale, shows all parts in their proper positions and

explains the framing besides indicating special features and all names and dimensions. The lavatory detail is one that is used to govern the positions of various fixtures the positions of which are mighty important so far as beauty and convenience are concerned. Positions of lights, shelves, soap dishes, lavatories, etc., should all be studied so as to create a pleasing balance and a convenient arrangement as well.

Now, we will ask some of the questions that a carpenter or builder might ask about this part of the structure and see how well the details answer them.

Q 1. What is the width of the wall?
Q 2. What do the symbols indicate?
Q 3. What material are the cupboards constructed of?
Q 4. Does the builder supply all materials and have all millwork made up?
Q 5. Does the builder install everything?
Q 6. What materials are used?
Q 7. How is the partition framed?
Q 8. How are the various units to be trimmed?
Q 9. What lath is indicated?
Q 10. Where will registers open out into the rooms?
Q 11. What type of registers are used?
Q 12. How does the clothes chute open into the room—what room?
Q 13. What kind of doors are used?
Q 14. How can the various units be located so as to begin construction?
Q 15. What type of flooring is used in the bathroom?
Q 16. How far above the floor are the bathroom lights?
Q 17. How many shelves are there in each cupboard?
Q 18. Are all shelves the same size?
Q 19. What kind of wood is used for shelves?
Q 20. How are shelves supported?
Q 21. Of what material are the shelves?
Q 22. How can the top of clothes chute be supported?
Q 23. How are the cupboards framed?
Q 24. What style are cupboard doors to be?
Q 25. How many shelves and how far apart are they?
Q 26. How thick is the lumber to be for casing?
Q 27. How is the wall framed above cupboards, registers, and chute?
Q 28. In what way is the larger cupboard made larger than the other one?
Q 29. Is any means to be taken to guard against cracks appearing in the bathroom floor?
Q 30. How is the tile to be laid?

The above questions constitute some of the questions that must be answered by either the written specifications or the detail drawings. The answers are explained in the following.

A 1. A dimension running through the clothes chute in the plan shows the wall is 13½" wide; 12" on Fig. 30 does not include lath and plaster.

A 2. The symbols in Fig. 30 indicate two cupboards, two registers, a clothes-chute opening, and a large closet door.

A 3. The cupboards are constructed entirely of wood. The notes on Fig. 54 near each cupboard detail specify the kind of wood used.

A 4. The notes near each detail in Fig. 54 specify that the owner will only furnish the hardware and that he will install the doors and hardware. This indicates that the builder must supply all materials except hardware and that he must see to it that all millwork is done and delivered to the job.

A 5. Everything but doors and the hardware on these doors.

A 6. The details and the rates specify birch for the doors and trim and yellow pine for the casing and shelves.

A 7. The plan indicates that the partition is framed by 2 x 4's.

A 8. All units are to be trimmed with birch according to notes on details.

A 9. No special lath is indicated. Unless the written specifications specify this particular item the builder can use his own judgment.

A 10. The register detail shows the registers will open out into the rooms at a point 7" above the floor.

A 11. This is not shown on the drawings. The heating specification should give this item.

A 12. The clothes chute is shown in the detail of that name in Fig. 54. Fig. 30 indicates it must open into the bathroom. The opening is a square door 12 x 12" located at a point 22 inches above the floor.

A 13. The doors are specified in the notes in Fig. 54 to be birch and of the same general type as specified for the table closet door in Fig. 47.

A 14. They can be located by first putting in a few 2 x 4's. The 2 x 4's at C, D, and E, for example, can easily be put into position by the dimensions locating them. Then by the width dimension other 2 x 4's can be located, etc.

A 15. This is shown in the bathroom floor detail in Fig. 54. The surface is to be tile. The foundation for the tile is concrete supported by wood flooring down between the joists.

A 16. The lights are 5'–8" above the floor as shown by the lavatory detail in Fig. 54.

A 17. Five. They can be counted in the details.

A 18. No. The plan shows the shelves for the bathroom cupboard are 12⅛" x 2'–2¾" where those for the other closet are 11¼" x 1'–6⅞".

A 19. The notes in Fig. 54 specify yellow pine.

A 20. The details show a three-sided moulding under the shelves and against the casing.

A 21. Shelves are yellow pine.

A 22. The details show 2 x 4 framing above the chute. The chute can be hung on these.

A 23. The details show the cupboards are cased by ¾" yellow pine tongued and grooved lumber and that this casing is supported by 2 x 4's spaced so as to form plaster backing.

A 24. The same style as the door for the table closet in Fig. 47.

A 25. There are five shelves each spaced 12" apart starting at the bottom. The top shelf is only 8".
A 26. ¾".
A 27. The details show 2 x 4's framed so as to continue the wall flush with the various doors.
A 28. The bathroom cupboard is increased in size by extending it out into the bathroom a matter of 3½" as shown in plan.
A 29. Yes. Wire lath is specified in the details.
A 30. The tile is to be laid by sheet on a ½" cushion.

Problem 12—Dormer. The legend for Fig. 56 applies to the circled numbers on both Figs. 55 and 56.

The dormer, which forms a part of the bathroom, is shown in elevation in Figs. 21 and 25. The plan is shown in Fig. 30. It is very evident that not nearly enough information can be secured in the above mentioned drawings, even though dormer construction is quite standard.

To provide additional and necessary information, detail drawings must be provided. The first step is to decide how this can be presented so as to best show all needed information with as few drawings as possible. The detailer should, therefore, make a study of the plans and elevations and decide what parts he will detail. A section will show some vertical and a few horizontal details. This isn't enough. A plan and elevation of the dormer framing will show a great deal. Therefore a section, plan, and elevation of the framing will be made. Because of the somewhat intricate framing the large $\frac{3}{4}'' = 1'\text{-}0''$ scale will be used.

Fig. 55 is used here to help the student picture the situation in his mind. The cross section was taken through the long dimension of the bathroom, through the special partition at a point going through the cupboard for the third bedroom, and at a point that takes the cutting plane through the window in rear wall. The student will do well to draw such a light line in Fig. 30. Study Fig. 55 and note the position of the wash basin in the bathroom in Fig. 30 and note its position in Fig. 55. Note the bathroom and bedroom doors in Figs. 30 and 55. Note the window in front wall of bathroom in Fig. 30 and also in Fig. 55. Locate other points in the same manner. It should become evident that you are seeing Fig. 55 in a direction from the bath tub toward the door. Certain features such as the special partition, second floor joists, etc., are merely indicated because of hav-

ing been detailed in other drawings. While such drawings, as Fig. 55, are not necessary in details, they are, nevertheless, a good idea because they help workmen to picture the plans more quickly.

Fig. 56 is the real detail drawing and shows the framing in the conventional manner. For the beginner it is always best to draw more or less of a picture, such as Fig. 55, in order to better understand the situation and thus be able to picture such details as shown in Fig. 56. This picture can be either accurate or a rough sketch.

It should be noted here that as the details progress many points previously detailed will appear. For example, note the 2 x 8 joists at the second floor in Figs. 55 and 56. The spacing of these joists, their size, etc., is given on such drawings as Fig. 52. Also the details for the double joists under the bathroom are shown in detail in Fig. 54. Now, as we progress in our detail drawings great care should be exercised to make sure that no confusion occurs because of two or more arrangements for one item.

At this point attention is also called to an item that proves the desirability of thorough details. A study of Fig. 55 will show the roof over bedroom 3 to be different than in Figs. 21 and 25. The structure shown in Fig. 55 is the correct one. It sometimes happens that a designer when developing an elevation or plan shows one or more items of a shape that would require costly or difficult construction, whereas by changing it a trifle the construction could be made easier. But the change is not always made. Thus in Figs. 21 and 25 the roof was shown in such a manner as would require difficult framing. Here the drawing of details brought out this point. Ordinarily the elevations should be changed, but the details are the final authority.

For the sake of clearness we will first build up Fig. 55 and then Fig. 56. Having determined where the cross section is to be taken the student should try to picture what the section will look like. Imagine that the house could be cut through on the cutting plane decided upon and one of the two portions resulting moved to one side so you could see the complete cut portion of the other part. As the dormer is all above the second floor we will draw from that point upward. Fig. 30 shows the house, at the point of the section, to be 22′-3″ wide from one sheathing exterior to the other sheathing exterior. So, lay out a distance of 22′-3″, according to scale and

draw a line between these two points. Let this line represent the surface of the rough floor. Next, draw in the front wall of the bathroom 3′-2″ back from the corner. These dimensions are shown in Fig. 30. The center line for special partition is 2′-6″ + 7′-11″ from

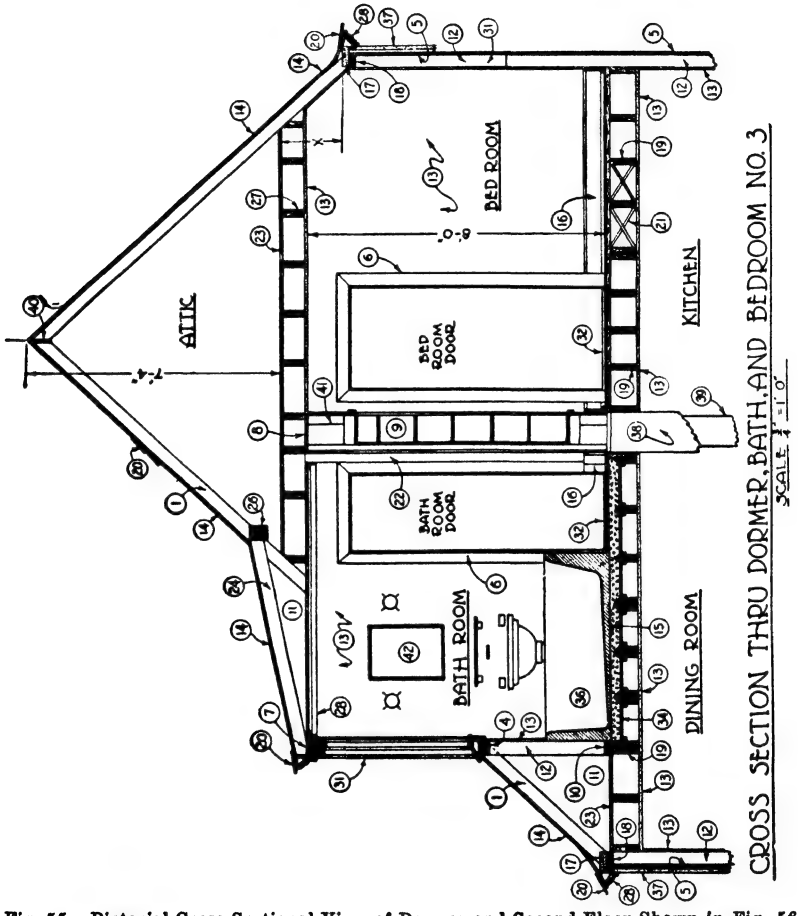


Fig. 55. Pictorial Cross-Sectional View of Dormer and Second Floor Shown in Fig. 56

the opposite corner. Draw these partitions upward for a distance. Then draw a horizontal line 8′-0″ above the line representing the second rough floor. An amount equal to thickness of finish flooring should be added to this dimension. This line just drawn represents the under surface of the second floor ceiling. The dimension is shown in Fig. 55. Allow plaster plus 2 x 8 joists, plus attic floor, and draw

another line at 23. This represents attic rough floor. From this line measure up a distance of 7′-4″ which locates the ridge of the

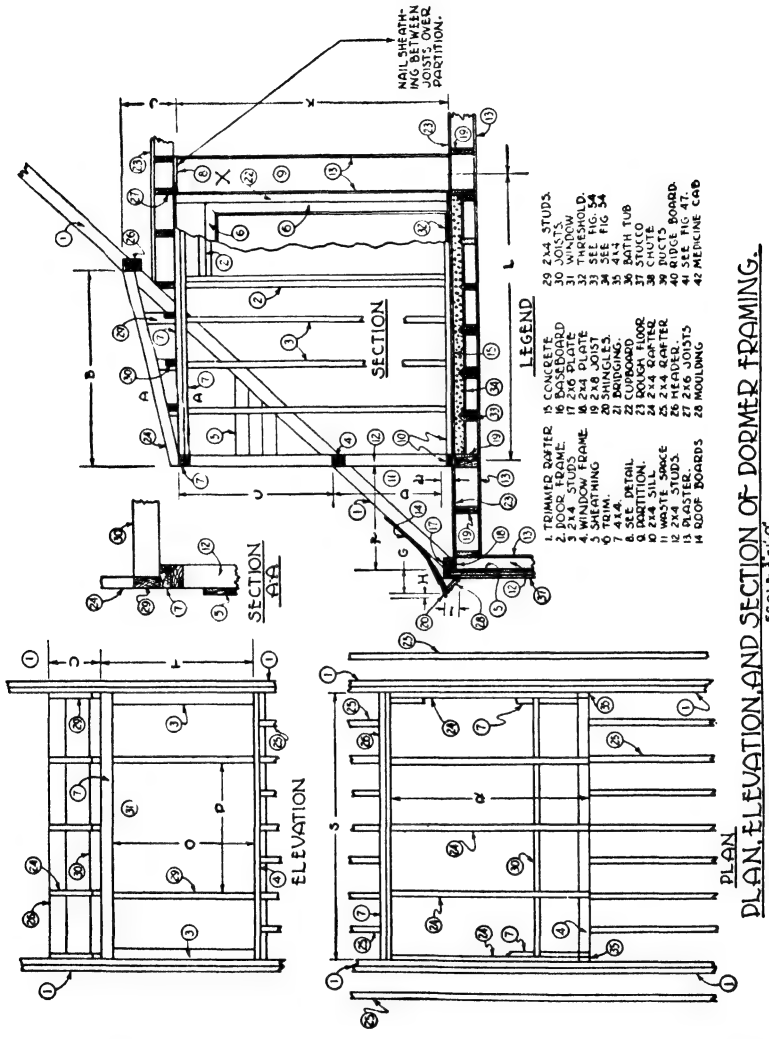


Fig. 56. Framing Details for Dormer for Cox Residence

roof. These vertical dimensions were taken from Fig. 21. Otherwise they are determined in company with the designer. Now connect partition and outside wall lines with lines representing the second floor ceiling. The cross section is now roughly boxed in.

The point of the roof vertex or ridge can be located next. Fig. 25 shows this to be exactly over the midpoint of the bedroom window which is 7'-11" (Fig. 30) from the back wall of the house. Figs. 21 to 25 inclusive all show that the point where the roof meets the side walls is below the attic floor. This is dimension *X* in Fig. 55. This distance is either taken from the designer's elevation drawings or from him directly. Where the roof meets the side wall at the second floor level, the cornice is level with the second floor. The roof can now be drawn in using 2 x 4 rafters as designated by detail in Fig. 25. Otherwise the designer supplies such information.

The ceiling of the dormer is the same height as the general ceiling so the 4 x 4 at 7 has its position determined. The position of the 4 x 4 at 4 is determined by the roof lines. The roof of the dormer is a point to be decided on by the designer, unless what he has indicated proves unwise, in which case, a conference between designer and detailer irons out the difficulty. The 4 x 6 at 26 is thus located by the slant of the roof over the dormer. The balance of Fig. 55 is filling in joists, plaster, and concrete floor for rooms, walls, etc., all of which is controlled by previously made details. The making of the detail drawings in Fig. 56 are developed as follows:

A study of Fig. 30, discloses that the bathroom partitions run continuously and form a part of the dormer. The dormer side walls are a continuation of the bathroom side walls. The section can be developed from the sketch in Fig. 55 or it can be developed in much the same manner as described for the sketch. Because the dormer walls are a continuation of the bathroom walls, it becomes obvious that they will be independent of the roof rafters. But the rafter spacing must be specified so that both trimmer rafters fit up against the dormer walls. In this section must be shown or indicated all framing parts. Care should also be taken to show all parts in their proper position. For example, the sheathing should be shown in back of the 2 x 4 studs and the studs must be shown in front of the trimmer rafter as reviewed from the side.

Dimensions at A, B, C, D, E, F, G, H, and I are the important dimensions because they control the shape of the dormer. Dimensions K and L are taken from the elevation (Fig. 21), and the plan (Fig. 30).

The member at 26 must be 4 x 4 because it supports one end of the dormer rafters and all rafters between the trimmers. The dormer ceiling joists at 30, and the studs at 29 are spaced for convenient application of laths and sheathing. Members at 7 and 4 are also called upon to support added weights and so must be 4 x 4's. Studs at 3 are spaced for convenience in application of sheathing and laths. The door framing at 2 is standard framing. The joist spacing for joists 19 and 27 are controlled by the framing plans and the location of the special partition. Details of the cornice are found in Fig. 25. The section taken at A-A is drawn to give a quicker picture of that portion of the dormer framing. The dormer framing elevation is drawn as though one were in front looking directly at it. The dormer framing plan is drawn as from a top view.

A careful study of the identifying numbers will quickly show what parts are necessary. The dimensions O, P, U, S, and R are the important dimensions. More could be added if desired. Dimensions U and J should be the same. Dimensions T and C should be the same. Care should be taken to see that all like dimensions check. The spacing of studs at 29 and rafters at 24 is made convenient for application of sheathing, plaster, and roof boards and to allow an opening for the window. The window size is given in Fig. 30. The joists at the area under the front wall of dormer and under the tub have been doubled to safely carry the partition weight and the excess weight of a tub filled with water. The detail at 8 indicates that sheathing should be nailed between joists at the top of the special partition. This forms a better nailing surface for the studs in the partition. Fig. 25 shows that the curvature of the roof at the cornice should have a radius of 5′-6″. The roof pitch is also given in Fig. 25.

Some of the typical questions can now be asked that the details should clearly answer.

Q 1. What is the dormer width?
Q 2. What is the ceiling height?
Q 3. How is the bathroom wall and the dormer wall connected?
Q 4. How is the dormer wall to be constructed?
Q 5. What size are the main members?
Q 6. Is the same cornice construction to be used on dormer as house paper?
Q 7. Where is the position of front wall of dormer?
Q 8. What is the slant or pitch of dormer roof?

Q 9. How many and what size rafter and joists are used?
Q 10. How high is the window sill above dormer floor?
Q 11. Is dormer ceiling at the same level as main ceilings?
Q 12. What is the spacing of main roof rafters?
Q 13. What is cornice construction?
Q 14. What size window opening must be made in frame?
Q 15. How are the dormer and main roof rafters supported at the point where dormer begins?
Q 16. What is to be the construction of the trimmer rafter?

The above questions are average or typical of what a builder would ask or look for answers in the details. The answers are given from the details, as follows:

A 1. The dormer width is shown by dimension S in Fig. 56 and by the dimensions 3'-8" + 3'-8" in Fig. 30.
A 2. Ceiling is shown by dimension K, also by the sum of the dimensions E, D, and C.
A 3. The walls are one and the same, or, the dormer wall is a continuation of the bathroom wall. This fact is illustrated in the section, Fig. 56.
A 4. The dormer wall is to be made up of 2 x 4 studs. Three studs are indicated. No dimensions are given, therefore, the spacing is left to the builder. The corners of the walls are 4 x 4 posts. The plates are also 4 x 4. There is the usual 2 x 4 sill.
A 5. The corner posts and plates are 4 x 4. Rafter studs, joists, and sills are 2 x 4. The plates are 4 x 4. Lower framing member for window opening is 4 x 4 and the support for the rafters is 6 x 6.
A 6. Yes. One cornice is sectioned in Fig. 56. No special mention about this one or the others mean that the details in Fig. 25 are to be used.
A 7. In the section, Fig. 56, the dimension F gives this as well as the dimensions 3'-2" in Fig. 30.
A 8. The slant is governed by the heights of the plate on the front wall and the member 26. Dimensions U and J give height of 26 above plate of front wall.
A 9. All rafters and joists are 2 x 4's. The number can be counted on the details. Approximate location is allowed the builder.
A 10. Dimension D gives this dimension.
A 11. Yes. The 4 x 4 plate is shown running continuously.
A 12. Five rafters are used. The spacing is left to the builder but shown approximately so as to make application of boards and shingles convenient.
A 13. This is shown in Fig. 56.
A 14. The dimensions O and P show this.
A 15. By a 4 x 6 girder which is spiked to the trimmer rafter at either end.
A 16. The trimmer rafters are made of two 2 x 4's spiked together.

Problem 13—Furnace Layout. The detailer is now interested in the design of the furnace, warm and cold air pipes, etc., but often

he is called upon to show these details and in such cases should know certain facts relative to this field.

It can be assumed that the design for the warm air system has been completed and the registers decided upon as shown in Figs 14 and 30. From the calculations of the designer, the sizes of ducts can be secured and it may be the task of the detailer to make a layout for the ducts in the basement and walls. The position of the furnace is generally already decided. In this case the position is determined by the requirement that the furnace be near both the fuel room and the ash removal room all of which have been designed following the wishes of the owner. The register locations are shown in Figs. 14 and 30 but only approximately, because the spacing and locations of studs and joists, to some extent, determine exact locations.

The detailer can begin by drawing a plan of the basement and drawing the furnace by a circle as shown in Fig. 57. Next, the various items such as girders and partitions should be indicated where possible and as shown in Fig. 57. Then from the designers rough sketches or from floor plans the approximate locations of registers can be plotted. These locations can be shown by the symbols for the boots such as at B, C, D, E, F, G, and H in Fig. 57. In these symbols the small rectangles indicate a cross section of the rectangular-shaped pipe or duct going up through the walls and the larger portion of the symbol indicates the boot proper. The boots can be twisted to fit the direction of the supply pipe or leaders. The exact location of the boot and the riser depends on the spacing of joists and studs because the risers must go up between them. Therefore, unless some detailed framing plan, in addition to regular framing plans, is available, no exact locating can be done without cutting either joists or studs, which is bad practice. In most cases little trouble is encountered. In new construction the spacing of joists can be controlled by the framing plans, and the stud spacing can be specified so as to provide the required space for ducts.

As already mentioned, it is very poor practice to cut away portions of joists, studs, or girders because all such framing members are only as strong as their weakest point. It follows, therefore, that if a member of this kind is cut at any point so as to reduce the area of its cross section, the strength of the entire member is no

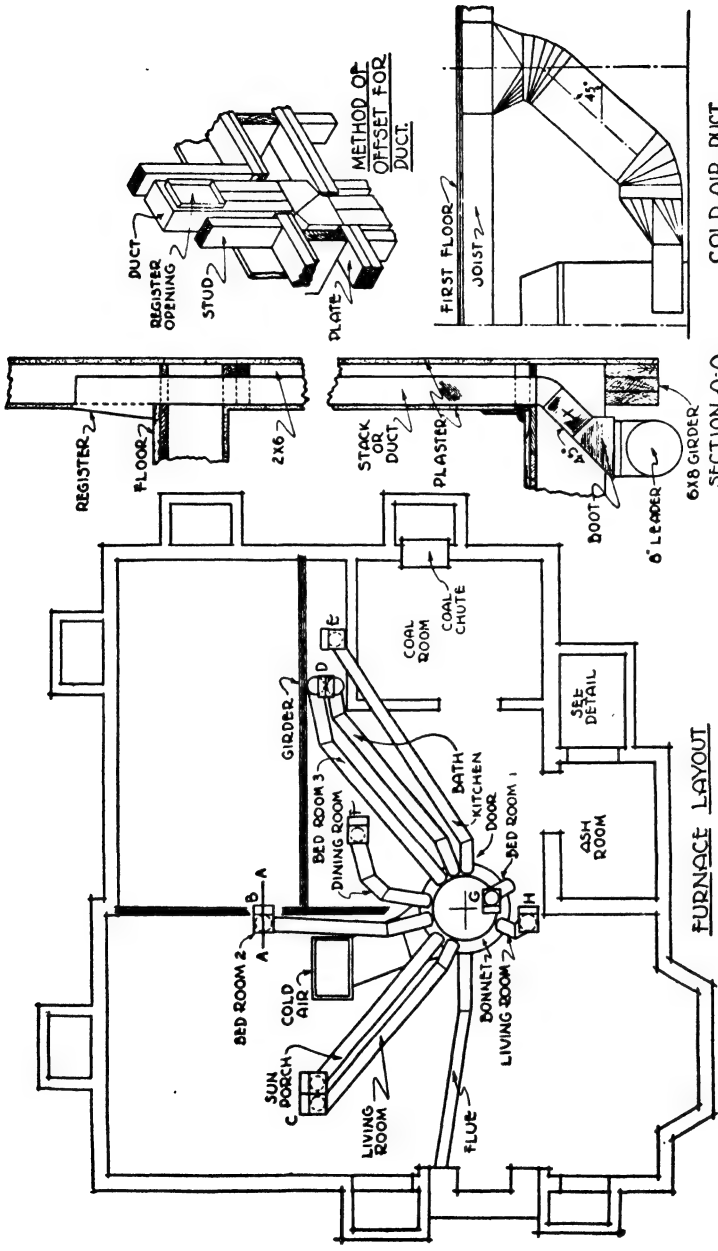


Fig. 57. Details of Furnace and Duct Layout for Cox Residence

greater than at the point of reduction due to cutting. If a register symbol is shown at a certain point on a plan, it can be expected that carpenters will frame for it, especially if such directions are written into the specifications.

The next step is to show the leader layouts between the furnace and the risers and also the cold air or recirculating duct. The cold air duct detail in Fig. 57 shows that the duct rises from the bottom of the floor. Therefore, its location must be only thought of, so far as leaders are concerned, so that the two do not conflict in the allowed space.

The collars can be lined from the center of the furnace, as shown in Fig. 57, or from the register outlets. The former is the best practice. The leaders should slope upward from the bonnets to the register outlets. Any necessary changes in directions of leaders must be gradual and, if too great, these changes must be accomplished by more than one gradual turn as in the case of the leader for the bathroom in Fig. 57. The leaders should be evenly distributed around the bonnet and, if possible, not be directly over the firing door. This isn't often accomplished. Leaders should be run so as not to interfere with passageways. For example, the leader going to the riser at B would have interfered with the basement stairway had it been placed on the opposite side of the girder.

The leaders in Fig. 57 were placed so as to cause the least amount of interference. It will be noted that it was impossible to keep leaders from being over the firing door, that they could not be evenly distributed, and that one had to be shown going through the coal room partitions.

The section at A-A, Fig. 57, shows how the leader is attached to the boot and how the boot runs into a short length of rectangular-shaped pipe X which in turn runs into an elbow before entering the riser. The short length of pipe at X is used so that it isn't necessary to cut away any part of the girder to make room for the boot. The riser is clearly shown throughout its length to the second floor register. This is also indicated at 29 in Fig. 50. The register at 30 in Fig. 50 is the dining room register shown at F in Fig. 57.

It sometimes happens that in order not to do much cutting of framing members it is necessary to offset a riser as shown by the method of offset shown in Fig. 57. There are many such means open

to the detailer or furnace erector all of which are all right so long as the turns or twists are constantly sloping upward and are not severe. The smoke pipe should be run in as short a line as possible from furnace to chimney.

Some typical questions can be enumerated concerning this layout such as would be asked from looking at Figs. 29, 14 and 30 or by the man doing the furnace installation.

Q 1. Are the collars lined from center of furnace or registers?
Q 2. What size leaders are used?
Q 3. How many cold air ducts are there to be?
Q 4. Where is the cold air duct located?
Q 5. What direction should the furnace face?
Q 6. How is the riser for the second bedroom supplied?
Q 7. Is the concrete contractor interested in this layout?
Q 8. How are the bathroom and the third bedroom supplied with warm air?
Q 9. Assume that the register for the first bedroom was so situated that the 2 x 4 studs in the partition underneath and the joists in the floor did not line up. How could the riser be carried to the register?
Q 10. Are double or single risers to be used?

The following answers show how the details answer such typical questions.

A 1. The plan in Fig. 57 shows that the collars have been lined from the center of the furnace.
A 2. The leader sizes should be shown on the plan near each leader. They are not shown here because this is a problem of detailing only.
A 3. A study of the plans shows only one cold air duct.
A 4. The cold air duct is so located as to lead to a corner of the living room nearest to the stairway. On an actual set of plans this should be accurately dimensioned.
A 5. The notation on the plan indicates that the door should face the coal room.
A 6. This is shown at B in Fig. 57. A leader runs from the side of the furnace nearest to the riser and connects up to the riser. The leader must be on the left-hand side of the girder so as not to interfere with the basement stairway.
A 7. Yes, because one of the leaders must go through the coal room walls in two places. The concrete contractor should be provided with the needed information and also the sleeves which are to be inserted in the forms before the concrete is poured. This saves having to cut through the walls later. The concrete man is also interested in having the coal chute on hand to put into place at the proper time.
A 8. Both of these rooms are to be supplied by risers coming up through the special partitions as shown in Figs. 53, 54, and 47. (On an actual job sizes for such risers would be given on details and in specifications.) These risers start at point D in Fig. 57 and are fed by two leaders.

A 9. Such a condition would be taken care of by means of an offset as shown in Fig. 57.

A 10. This information should be found in the specifications and could conveniently be shown on the details.

Problem 14—Basement Closet Details. In the basement plan, Fig. 29, the student is referred to that area where the two risers for the bathroom and the third bedroom start. This area is just outside the coal room and is between the coal room wall and the 8 x 8 column. It will be noted that this area is divided into two parts by a narrow partition running from the 8 x 8 column to the 6″ coal room concrete wall. This much information gives some indication that some further details must be consulted. Also, the fact that the clothes chute, as shown in Figs. 48, 53, 54, 55, 52, and 47, ends at the location of this area leads one to believe that some further detailing is necessary.

The owner, as is evident from his plans for other parts of the house, has definite ideas about wanting special details and because these details are quite special their detailing cannot be shown on a floor plan.

Assuming the ideas for this particular area have been discussed with the owner, it is quite likely that the detailer would be required to make up the details. The details will require an enlarged plan view in addition to the sections, etc., because Fig. 29 is almost entirely lacking in such necessary information. Also, there will be required enough details to indicate the desired results. We can, as stated above, assume this area must contain two closets, one of which will serve as a receptacle for such clothing as is dropped down the chute and the other for a general laundry storage closet wherein soaps, etc., can be stored. It is desirable that the clothes receptable be dirt proof to a high degree and yet not cost a great deal.

The first thing to do is to lay out the plan view of the area as shown in Fig. 58. This view should indicate positions of the main items such as chute and ducts and show the building members in their proper location. In laying out this plan we start at the foundation wall which forms the right-hand boundary of the area. We start here because all dimensions are taken from the foundation. The 5′-0″ dimension locates the 8 x 8 column; the 5′-0″ + 3′-7″ dimension locates the left outside edge of the wood partition form-

ing the left-hand boundary of the area. The narrow partition can next be located being flush with the right-hand side of the column.

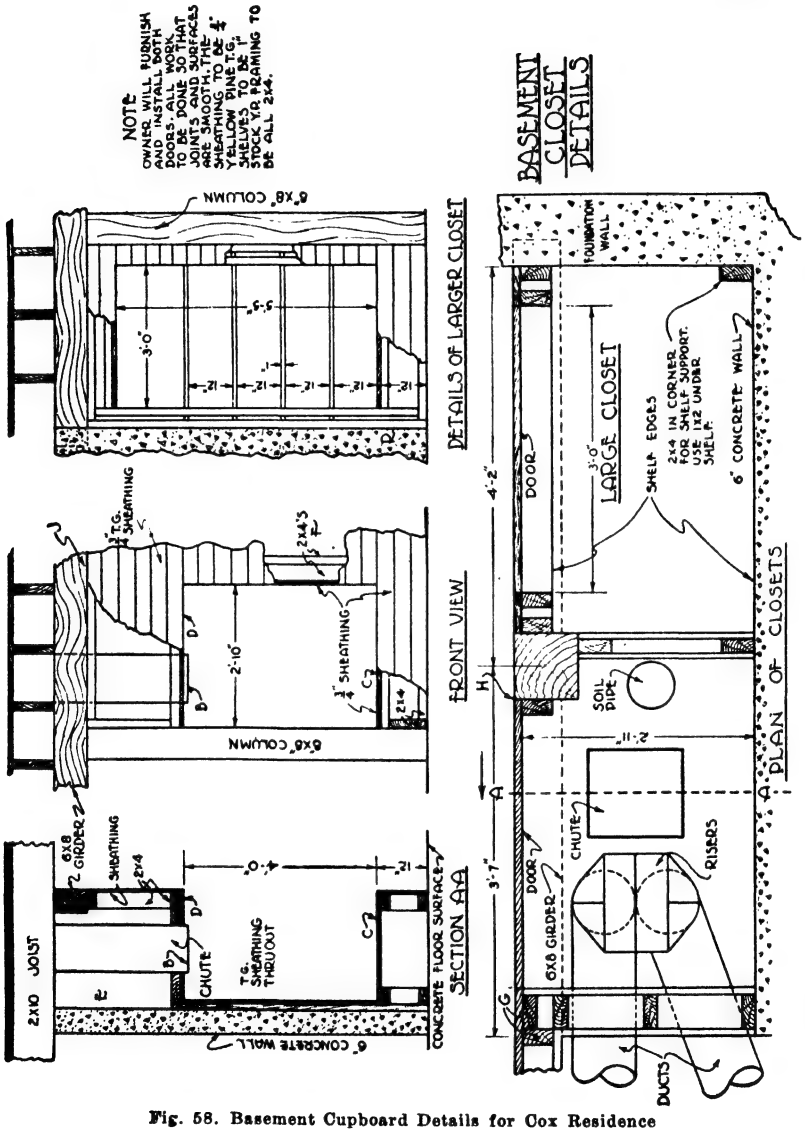


Fig. 58. Basement Cupboard Details for Cox Residence

Using dimensions found on details (Figs. 53, 47, and 48) the positions of soil pipe, chute, and risers can be calculated and the symbols drawn in. It would be very difficult to show much more informa-

tion on the plan other than a few overall dimensions so details are used.

Note cutting plane A-A in the portion of the area beneath the chute. The arrow shows the direction the detail will assume. The detail section at A-A shows a cross section of the area beneath the chute. The front view detail gives another detail of the same portion. At B, on both details, is shown the lowest portion of the chute. The floor of the clothes receptacle is shown at C. This was made 12″ above the concrete floor. The roof or top of the receptacle is shown at D. This was drawn 4′-0″ above the floor so as to leave ample room for the riser leaders in the space at E and, at the same time, provide an amply large space for the clothes which can be dropped down the chute at odd times and be stored in this receptacle until the day for washing. The entire space is then shown enclosed and framed with 2 x 4's. The 2 x 4's are selected in place of smaller stock so as to provide maximum stiffness. It might here be explained that the Front View is that view one would have if he were to stand alongside the wash tub symbol, shown in Fig. 29, and look directly at the area in question. It should then be seen that the 2 x 4's shown at F, in the front view, are the same 2 x 4's shown at G in the plan view.

The remaining space in the area will be used for a closet which is to contain five shelves. This is shown in the detail named, "Details of Larger Closet." The first shelf is put 12″ above the floor and the remainder at 12″ intervals. The shelf is to take up the entire area of the closet as shown by the arrows indicating shelf edges. A 3′-0″ door is framed for in as plain a manner as possible. The height of the door opening is made to a convenient level. The concrete shown at R is the foundation wall. These details are excellent so far as practice in visualization is concerned and the student should study them until he can easily form a mental picture of the entire area. It will be noted that the sheathing has been cut away in places. This serves the dual purpose of showing the framing and indicating sheathing as well. In this problem the explanation has been made more brief as it is felt that the student should be able to understand the detailing from what he has studied in the previous problems.

Following are a few typical questions such as the carpenter and

estimator would ask about this part of the house before and after they knew the scheme for this area.

Q 1. Where does the clothes chute empty?
Q 2. For what is the area under the special partition on the first floor to be used, as in the basement?
Q 3. Why is the narrow partition shown between the 8 x 8 and the coal room wall?
Q 4. How is the 8 x 8 column and the 6 x 8 girder worked into the plans for the two closets?
Q 5. What sort of a storage space is provided for soiled clothes?
Q 6. How is the space taken care of which is necessary for the leaders and boots?
Q 7. What type of framing is used?
Q 8. What size is the space for clothes?
Q 9. What size door is used?
Q 10. What is the other closet like?
Q 11. How many shelves?
Q 12. What is the size of the shelves?
Q 13. How are shelves supported?
Q 14. What size is the opening and the door?
Q 15. How are the closets sheathed?
Q 16. How are the closets framed?

Following are the answers to the above questions:

A 1. From Fig. 58 it can be seen that the chute empties into a closet or receptacle, which is lined with tongued and grooved sheathing, and has a door.
A 2. This question is answered by the details which provides that this space is to be used for two closets.
A 3. The details prove this narrow partition to be the dividing wall between the two closets.
A 4. The plan view and details in Fig. 58 show that the sheathing is to be flush with the outside faces of the girder and column. Thus, the girder and column are not visible as such on the outside and form part of the framing for the closets. Examples of this are at H and J in Fig. 58.
A 5. Answered in A 1.
A 6. The roof or top of the clothes closet or receptacle is made low enough so as to come below the elbows while the leaders are attached to the boots of the risers.
A 7. The framing other than the girder and column is composed entirely of 2 x 4's. A specification on the drawing gives this information.
A 8. The clothes space is 4'–0" high, 2'–10" wide, and 2'–11" deep.
A 9. The door will be 4'–0" by 2'–10" which is indicated by a specification on the drawings and the specification also states that the owner will furnish and install both closet doors.
A 10. The other closet uses the balance of the area to the fullest extent for five shelves.

A 11. There are five shelves.
A 12. The shelves are the full size of the closet and are each 1" thick.
A 13. A specification on the drawing specifies that a 1 x 2" strip is used under each end of the shelves. The 1 x 2" strip is supported by 2 x 4's.
A 14. The opening is 5'-5" by 3'-0". The door will be furnished and installed by the owner.
A 15. The sheathing is regular ¾" sheathing, tongued and grooved.
A 16. By 2 x 4's.

Problem 15—Front Entrance Stone Work, Ash Removal Details, and Downspout to Sewer Connection, and Girder Support. Examining Figs. 14, 21, and 29, we find that there are additional items which need more information to be shown on them before the tradesmen can go ahead with their estimating, ordering of materials, and actual construction. Figs. 14 and 21 both show rubble around the front entrance and Fig. 29 shows the cutting plane H-H which is a direct indication that details are necessary. Fig. 14 shows a rubble symbol on both sides of the door symbol, and Fig. 21 shows the actual stone work in elevation but no details or information is given on either sheet. Fig. 21 also shows downspouts and it is necessary to give more information concerning their connections to the sewer. Another necessary detail is one to show the supports for girders. Fig. 29 shows on the plan view but does not give what is especially needed—the connection details with the girders. Fig. 59 shows all of these details on a typical detail sheet.

The front entrance detail must show the outside wall, an inside partition, part of the door, and all framing in addition to details of the stone. The door is between partitions which are 4'-6" apart. (See Fig. 14.) By first drawing a vertical line to indicate the center line of the door, we can next easily determine the door frame position as at B, Fig. 59. This in turn locates the 2 x 4 at A. The center line of the partition is then easily located by dimension C. This calculation is made using the 4'-6" dimension and the center line of the door. Now, the outlines of the partition can be drawn and the plaster indicated. The 2 x 4's being located at A the outlines of the outside wall can be drawn in.

The stone size can be assumed as that is not strictly the job of the detailer. However, the size specifications should be specified on the detail, along with joint specifications. Mortar can be shown on the detail or in the written specifications. We will take the

largest sized stone and frame for it. It should extend out beyond the surface of the stucco to give the best appearance so the 4″

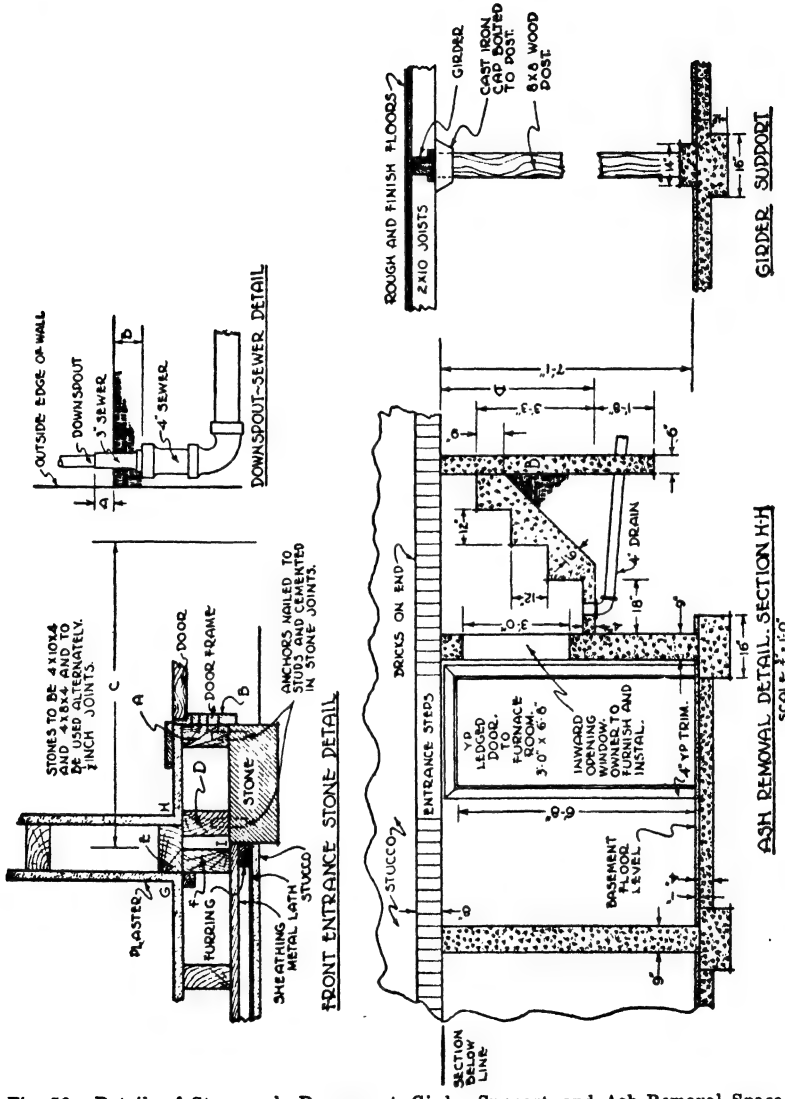


Fig. 59. Details of Stonework, Downspout, Girder Support, and Ash Removal Space in Cox Residence

width would be the one selected. The stone will be anchored to the frame. Therefore, another 2 x 4 must be provided for at D. The 2 x 4's at E and F are necessary for supports and as a nailing sur-

face for laths at such points as G, H, and I. The stucco and sheathing plus the furring is then drawn in. Dimensions here are not necessary because the center line of the door is easily calculated and the walls and partitions are dimensioned in Fig. 14. The various 2 x 4's need no special dimensions because their positions are fixed with regard to walls and partitions and ordinary 16″ spacing.

The Ash Removal detail, indicated by section H-H in Fig. 29, is drawn by first showing the two walls in section that the line H-H cuts. On the detail, Fig. 59, we have also shown the left-hand wall of the ash room. The spacings of all these walls are given by dimensions in Fig. 29. The heights can all be calculated from the vertical dimensions shown in Fig. 21. The depth of the stairway section (dimension A) will be decided by what is considered a convenient distance above the basement floor. The number of risers and treads are decided also by convenience. The wall B is carried down far enough to be below the frost line. The dimensions work themselves out as these things are decided. The drain is necessary because rain and snow can collect in large amounts in such a large opening and if not drained would overflow into the basement. The window opening location is made convenient and far enough above the floor of the stairway area to prevent rain water from affecting it in the event the water did not rapidly drain off.

The girder support detail is a simple drawing showing the concrete footing, the column, and a portion of the girder. The cast-iron cap specification is the important part of the detail.

The sewer connection for the downspout need simply show the downspout and the necessary fittings along with such dimensions as A and B.

Following are typical questions that the details should answer.

Q 1. What size of stone is to be used around the front entrance?
Q 2. What kind of stone is it?
Q 3. How are stones fastened to the frame?
Q 4. How is the framing done?
Q 5. How is the door frame set and fastened to the wall?
Q 6. Do stones extend out beyond the stucco surface?
Q 7. What is the plan of the ash removal system?
Q 8. What size window opening is necessary?
Q 9. What are stairs made of?
Q 10. What is the stair size?
Q 11. What is the depth of the stair area way?

Q 12. Is area way drained?
Q 13. What is the floor thickness in area way?
Q 14. How is the downspout connected to the sewer?
Q 15. How are columns connected to girders?

The following answers are obtained from the details.

A 1. Two sizes are to be used alternately. The sizes are 4 x 10 x 4 and 4 x 8 x 4.
A 2. Rubble.
A 3. By anchors. The anchors are to be nailed to the 2 x 4's and cemented in the stone joints.
A 4. The framing is arranged so as to provide two 2 x 4's to serve as supports for the stonework and other 2 x 4's at points where they serve as nailing surfaces for laths in addition to their functions as regular studs. One 2 x 4 serves as a backing for the door frame on each side. Two 2 x 4's serve as a place to nail anchors.
A 5. The door frame is nailed directly to 2 x 4's.
A 6. Yes—this creates an entrance detail of more prominence. But no special care need be given here because framing and size of stones will bring about the desired results.
A 7. There is a small room, accessible by a door of usual size, just beyond the front of the furnace. In this room ashes can be stored for days or weeks in cans or baskets. Occasionally these receptables can be removed through an inward window opening to a small area way opening and thence up steps to the ground level.
A 8. The opening is 3'-0" high and can be 3'-0" wide. The first dimension is found in Fig. 59 and the second can be scaled from Fig. 29.
A 9. The stairs are of concrete.
A 10. The stairs have 12" risers and treads.
A 11. This is given by dimension A.
A 12. Yes—by a 4" drain leading to the sewer.
A 13. 4".
A 14. The spout empties into a 3" sewer pipe which in turn connects with an ordinary 4" clay sewer pipe.
A 15. By a cast-iron cap bolted to the column and having the girder rest in the cap.

PRACTICE PROBLEMS

The following problems all refer to Figs. 32 to 38 inclusive.

Problem 1. Detail the porch at the rear entrance. Show on all necessary drawings, cross sections, etc., size, shape and location of every part entering into the construction of the porch and roof. Show proper symbols, all dimensions, and give specifications relative to materials.

Problem 2. Detail the area way around the window in the basement just above the laundry tubs.

Problem 3. Show by details how the part of the construction above the basement windows is supported. Also show a cross section of the window and frame. Give material specifications.

Problem 4. Show by details how the floor joists around the fireplace and chimney are supported at the first floor.

Problem 5. Detail the shelves in the basement fruit closets.

Problem 6. Detail the arch between the living room and dining room. Note: Remember that details are worthless unless they are thoroughly dimensioned, therefore, make sure that all of your details are fully dimensioned.

Problem 7. Detail the front entrance steps and all masonry work.

Problem 8. Detail a complete wall section assuming the house is wood frame. Show this by a cross section from the bottom of the foundation to the top of the roof.

Problem 9. Detail the cornice of the main roof.

Problem 10. Detail the dormer as seen from front elevation.

Problem 11. Illustrate how the hot air stack is carried to the bedroom in the lower right-hand bedroom of the second floor plan.

Problem 12. Show by detail how the sun parlor roof is fastened to the main wall of the house.

Problem 13. Detail the fireplace and hearth.

Problem 14. Detail the stairs from basement to first floor.

Problem 15. Detail the bathroom tile floor.

Problem 16. Detail the stairway between first and second floor.

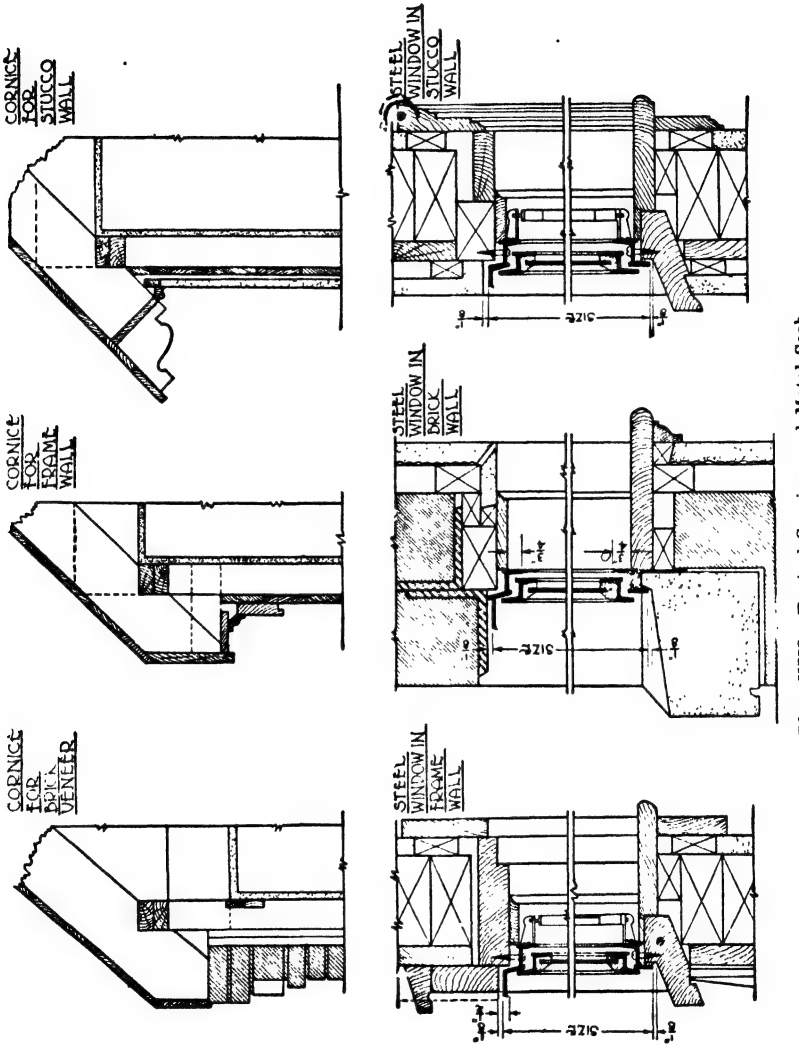
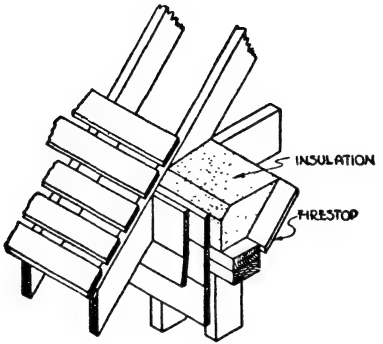
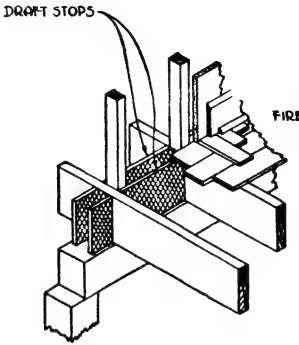


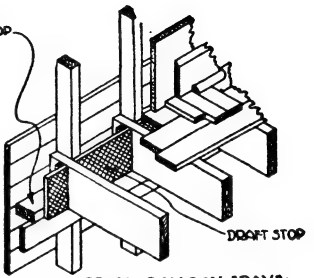
Plate XIII. Typical Cornices and Metal Sash



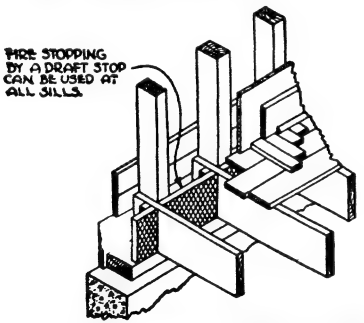
FIRE STOPPING AT CORNICE



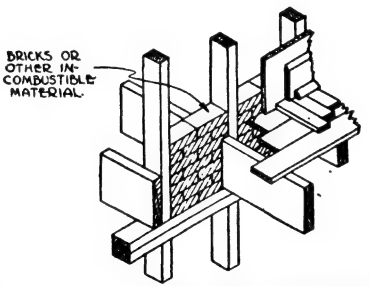
FIRE STOPPING AT GIRDER



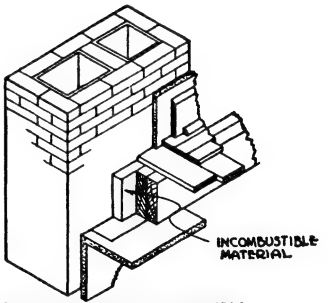
FIRE STOPPING BALLOON FRAME



FIRE STOPPING WESTERN FRAME.



FIRE STOPPING PARTITIONS



FIRE STOPPING AT CHIMNEY.

FIRE STOPPING

Plate XIV. Typical Fire Stopping

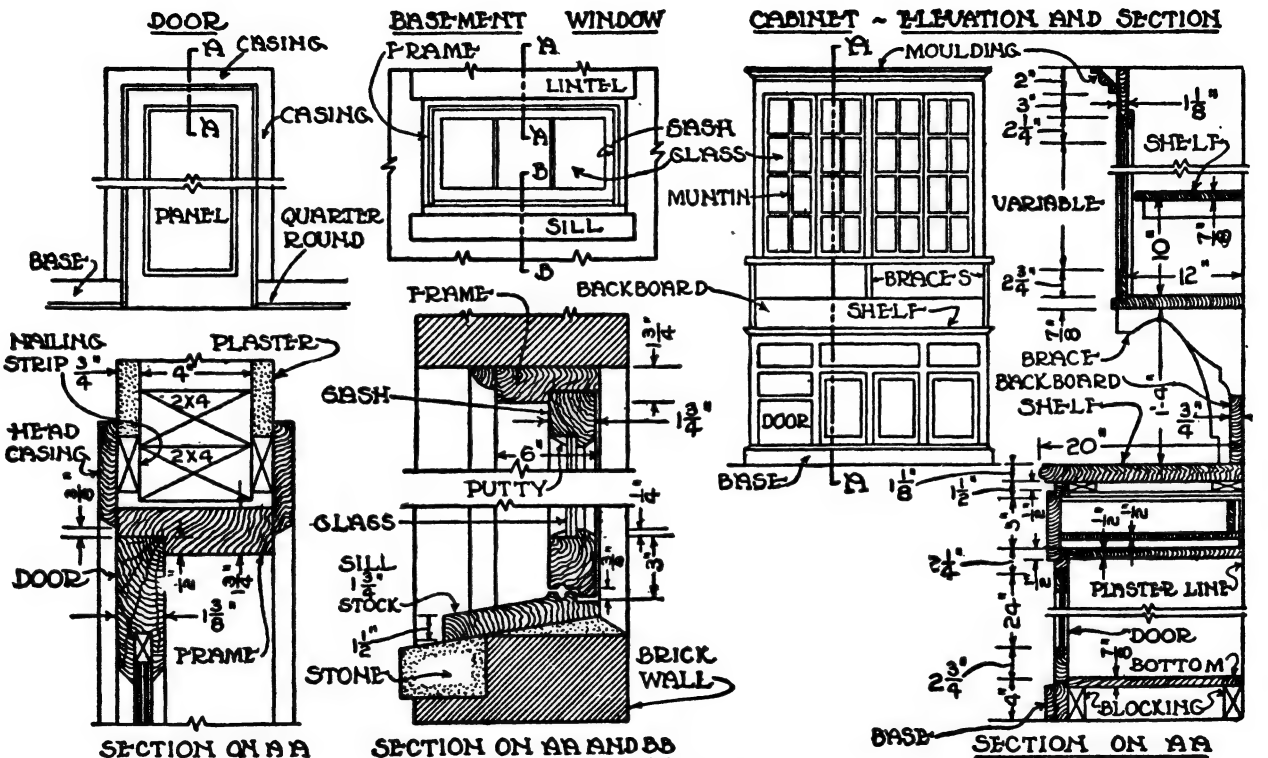


Plate XV. Typical Details

RENDERING IN PEN AND INK*

Rendering in pen and ink requires much practice and experience before one can successfully undertake the rendering of large and important drawings. Rendering, unlike standard Architectural Drawing, requires only the use of an ordinary pen holder, pen point, and ink. In Architectural Drawing we learned to use triangles, scales, T-squares, compasses, etc., to lay out our work, thus making it true and accurate without requiring much special skill beyond the proper use of the instruments. In Rendering, however, we are required to attain, by careful practice, the art of drawing freehand. It should be stressed at this time that practice is the only means of developing skill and should be undertaken most carefully and with the utmost patience and determination. Complete success which will allow us to do really important drawings cannot be attained by a few short practice periods nor within a few short weeks.

There are many things, however, concerning pen and ink work which can be readily learned at the beginning, thus allowing the student to make simple drawings within a reasonably short time, which gives him the ability to put to actual use the skill required. With continued experience and practice his skill will develop to the extent that he can accomplish large and important drawings.

MATERIALS

Pens. It is difficult to obtain definite kinds of pen points at many places because they change and improve from time to time. In general, however, one can use a medium fine and a heavy point satisfactorily. The fine point is used to draw the light lines, and the heavy point is used to draw the dark lines. The student will quickly develop his own likes and dislikes in the matter of pen points as he learns to accomplish good rendering. Tank pens, which hold a supply of ink are often used to advantage. But whatever type of pen point is used it must be remembered that it should be cleaned frequently while in use and always after being used. A soft dry or damp cloth will clean points easily. No hard or rough article

* By David A. Gregg. Revised by J. Ralph Dalsell.

should be used to scrape or clean a point as such practice makes small scratches which causes ink to flow improperly. On ordinary points care should be taken that only a nominal amount of ink is used at each filling. The quill in the bottle of ink can be used for this purpose.

Ink. Any India ink put up in bottles will serve the purpose for rendering. Care should be taken to keep the bottles capped at all times to prevent the ink becoming too thick. Always shake the ink bottles before each work period.

Paper. Any good grade of cold or hot pressed drawing paper may be used. The surface of the paper should be smooth. Some cheaper papers have a rough soft surface which will not do for rendering. In rendering, good drawing paper is frequently mounted on card board so as to give the drawing stiffness. However, this is generally for only the larger drawings starting at a size of 15 x 20 inches and up.

Pencils. When rendering is being done in pencil, which is seldom, a rather soft black lead pencil is required. For such purposes, it is advisable to secure a good grade of pencil and not attempt to use a cheap one. Good pencils can always be purchased at stationery stores, drafting equipment houses, etc.

PRELIMINARY DRAWINGS

Perspective. Before the rendering proper can be started, we must have the object outlined accurately either in perspective, isometric, or elevation. However, the greatest majority of renderings are done in perspective so as to give what is really a picture of the object. The architect has for his object residences and other buildings which he renders in order to picture what his plans will be like after construction has taken place.

The drawing of perspectives is really a study in itself and should be mastered by all students who would become experts in rendering. While a review of Perspective Drawing will not be given here, something can be said concerning the method of drawing a perspective. By the time an architect starts thinking about a rendering, his floor plans and elevations are generally completed. With one floor plan, and a front and side elevation a perspective can be made.

In studying Fig. 60, one sees that the diagram can be the first floor plan. The end and front elevations are part of the regular working drawings. The drawings, however, need not be on the drawing board as dimensions can be taken from them to use in the construction of the perspective. First, draw the line HPP. The diagram (first floor plan) is generally put at about 30° to HPP, although this angle varies according to how much of the end view we want to show in the perspective. The smaller the angle at R the less is seen of the end view in the perspective. The line VH is drawn at a distance from HPP as determined by how large we want the perspective. The closer VH is to HPP the smaller the perspective. Line VH_1 is drawn below VH a distance as determined by the appearance we want the perspective to have. The lower VH_1 is the more like a bird's-eye view the perspective becomes. The placing of these lines is governed by practice. Point SP^V is always on line VH. The position of SP^V to left or right determines how we want to look at the house—that is—from one end or the other. SP^H is always between lines VH and VH_1 and its exact location is also determined by appearance and practice. The lines SP^H—X and SP^H—X are parallel to line ae on the diagram and so that line SP^H—Y is parallel to line eb on the diagram. At the points X and Y, drop perpendiculars to the line VH establishing points V^{ad} and V^{ab}. These points are the vanishing points.

The line EF, in the diagram, intersects HPP at E. This represents the vertex of the house. From E drop a perpendicular to VH_1. This perpendicular is the line S. We will locate in the perspective the line JZ, which is in the diagram, as an example of how to draw a perspective. From SP^V draw a line through HPP to point J of the chimney. This line crosses HPP at O. From O drop a perpendicular as shown by line Q. From the elevation measure the distance from the bottom of the house to the top of the chimney. Lay this distance off on the line S starting at line VH_1 and measuring upward. This gives the distance HG. From G draw a line to V^{ab}. Where this line crosses line Q, will be the point L which is the perspective of point J in the diagram. Next, draw a line from SP^V to point Z and at the point where it crosses HPP drop a perpendicular, and where this perpendicular crosses the line from G to V^{ab} will be the point U which is the perspective of the point Z in

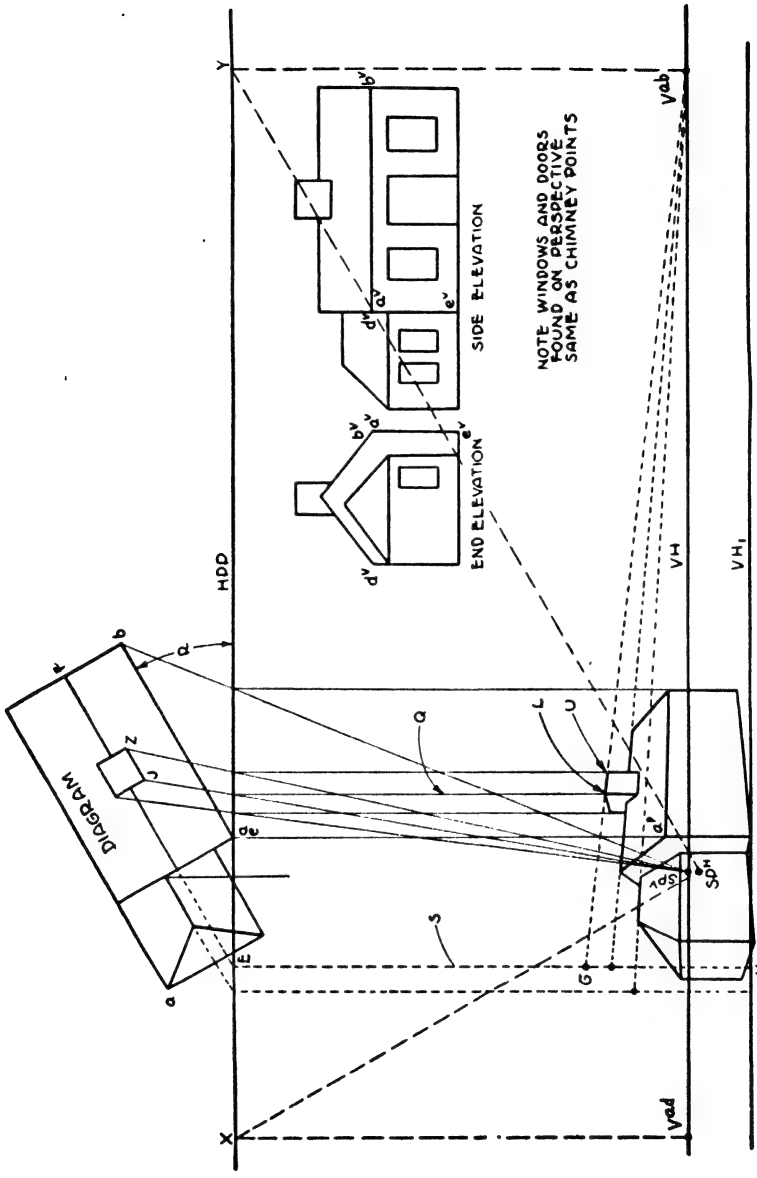


Fig. 60. Perspective Method of Laying Out Rendering

the diagram. Thus, the side of the chimney JZ has been drawn in perspective and is shown in perspective at LU. All other points are found in much the same manner.

Tracing. These perspectives are made with the aid of the usual drafting instruments and must be complete like the practice sheets at the end of this material. They are made in pencil only and very lightly and the rendering in ink is all freehand. The manner of drawing the rendering is explained later in this material. If it isn't desired to make the inked rendering on the same sheet that the perspective was drawn, a piece of tracing cloth or vellum paper can be tacked over the pencil drawing which will show through the cloth or paper and be a guide for the rendering.

The student will eventually notice that a rendering done entirely freehand has much more life and feeling than a rendering done with instruments. All renderings should be done absolutely freehand once the perspective outline has been made.

LINE WORK

Quality of Line. Too much stress cannot be laid on the importance of a good line, however insignificant it may seem, for care in each individual line is absolutely necessary for good work. A line that is stiff and hard, feeble, scratchy or broken, will not do. Fig. 61 shows excellent line quality. Every line shows the freehand effect which takes away or prevents the mechanical like appearance that would have resulted had the various lines been drawn using instruments. To illustrate this point, the student is advised to compare Fig. 61 with a standard elevation drawing such as studied in the Architectural Drawing portion of this book. A further study of Fig. 61 shows that each line, whether long or short, has a firm quality and is free from scratchy or broken places. Had any of the lines been made so that they continually crossed one another they would have appeared scratchy. Notice that at various places the lines assume practically the same curvature or direction. At one spot all lines have one curve, at another point all lines have a double curve, etc. The entire drawing is made up of a series of areas or spots where lines curve uniformly, in the same direction, etc. Notice, too, that in each such spot or area the lines are long enough or follow the curvature in such a manner as not to appear broken.

The student is advised to study carefully Figs. 61 and 62 taking time to note every half-inch square area. Study the lines, their spacing, length, weight, directions, etc. Then the first trial, with pencil, may be made in an effort to duplicate certain areas or spots

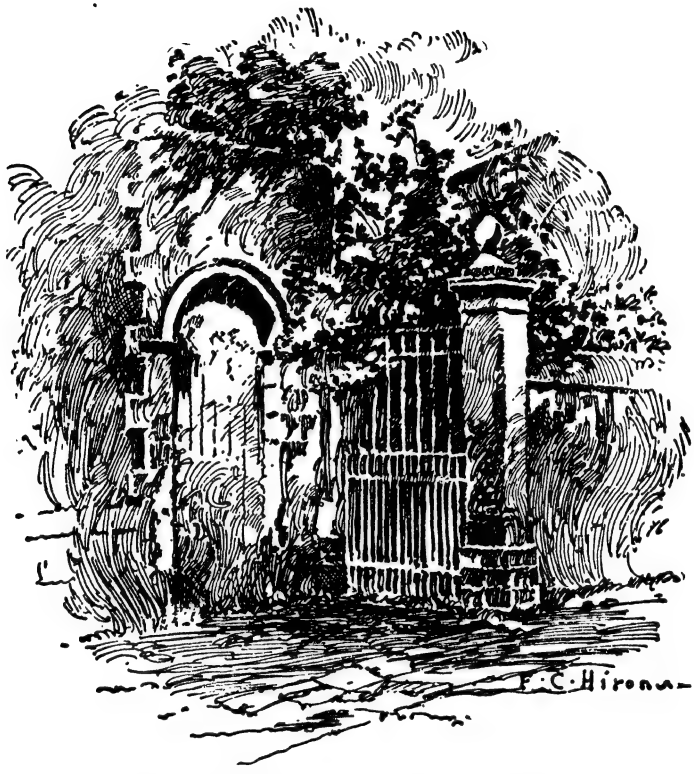


Fig. 61. Example of Excellent Line Quality

in both Figs. 61 and 62. Go about this initial practice slowly and carefully in somewhat the manner as illustrated in Fig. 63.

Every line of a drawing, as in the outline of a building, and each line of the rendering, even to the very shortest, must be done feelingly, gracefully, and positively. Usually a slight curve is advisable and if long lines are used, a quaver or tremble adds much to the result. Each line of a shadow should have a slight pressure of the pen at the lower end. This produces a dark edge in the group of lines that make the shadow, giving definiteness to it and a contrast to the white light below it.

Method. The combination of individual lines produces what is called a method. In a method we may have perfectly made individual lines, but the combinations into areas or spots may be unfortunate or bad with the result that the entire rendering is ruined.

Fig. 62. Example of Excellent Method

Fig. 63. Example of Line Work

Therefore, it is very important to practice making groups of lines so as to accomplish a good method. Fig. 62 shows an excellent method. Here the various combinations have been so designed that the result makes a soft and beautifully alive drawing. There is an utter absence of anything rigid or mechanical. Observe how gracefully and softly the edges of the drawing merge with the white of the paper. The vigor or emphatic part of the drawing is gathered

in the dormer making it stand out so clearly that the surrounding roof and vertical wall just seem to melt away. Practice making this method by putting a piece of tracing paper over Fig. 62 and tracing the outline roughly. Then on the tracing paper practice the method. Do this several times and try to make each trial better

Fig. 64. Vertical Line Method

than the preceding one. Compare carefully each of your trials with Fig. 62 until you not only find your weak places but learn how to improve them as well.

Vertical Lines. The simplest method is obtained by the use of the vertical line. Some drawings can be made entirely by this means. In Fig. 64 every line is vertical. This illustrates the value of a good individual line. It will be observed that although vertical, these lines are not severely straight and stiff, they tremble a little, or have a slight suggestion of a curve. In the shadow at the bottom of the drawing, each line is emphasized at the top by a slight pressure, and made thin at the lower end in order to soften off the edges of the drawing as a whole.

Free Lines. Fig. 65 shows another method. The vertical line is discarded and the freest possible line is used. No one direction is followed, but the lines go in any or all directions. Which is the better method? The answer doubtless must be that the free method is the least conspicuous and it is better adapted for general use.

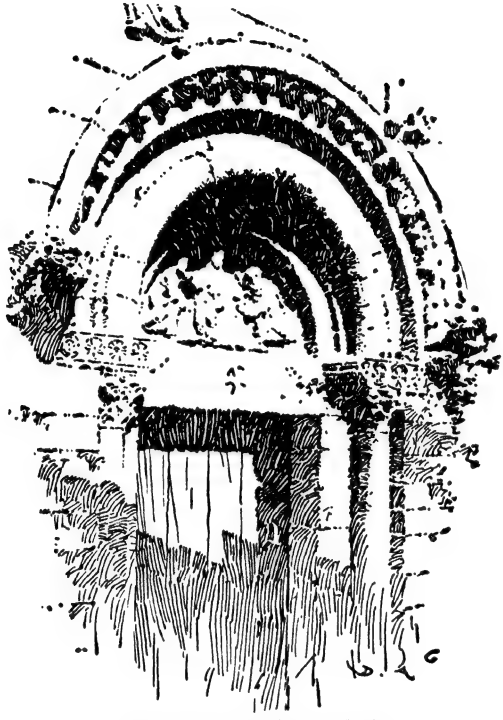


Fig. 65. Free Line Method

In Fig. 66 are shown many examples of rendering most of which have some faults. At A the lines are short and broken resulting in a spotty effect. This is a fault the student must avoid. The white spaces at the ends of the lines are too conspicuous. At B we find the opposite in character to A. There are long, unbroken lines but so severely straight as to be hard or mechanical in appearance. At C the individual lines are good but the method is not good. At D the lines are fairly good as to method but rather too coarse to be agreeable. At E an effort is made to avoid all the faults shown in A, B, C, and D. The student should not go beyond this point until Fig. 66 is fully clear.

LIGHT AND SHADE

Values. If several lines are drawn parallel and quite close together, but not touching, a gray, or halftone value is the result.

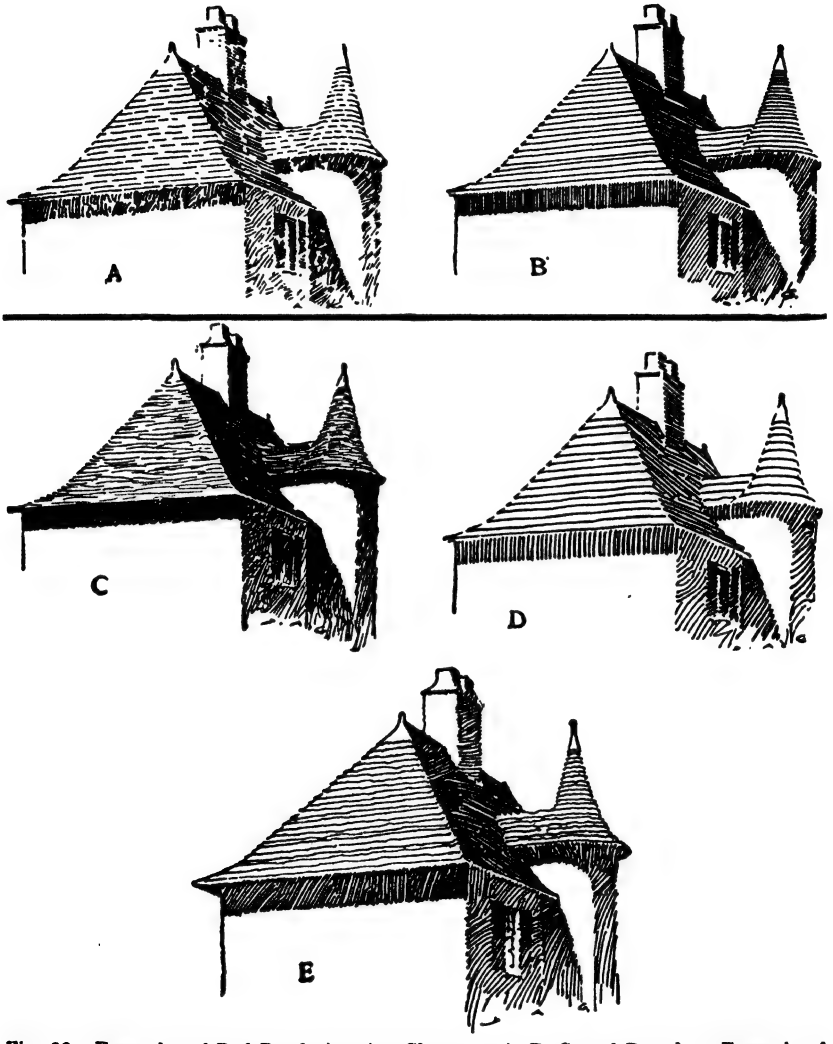


Fig. 66. Examples of Bad Rendering Are Shown at A, B, C, and D and an Example of Good Rendering Is Shown at E

Lines drawn so close together that the ink of one runs into the ink of the other, with little or no white space between, gives a black value. The white of the paper untouched by the pen gives a white

value. Fig. 67 shows two examples of rendering with only two values—black and white. In such renderings the outline of the house is inked in freehand, a few things like shutters darkened, and trees

Fig. 67. Black and White Method
Courtesy of Architectural Forum

or shrubbery made dark or given a dark value. No material such as bricks or shingles are indicated.

Figure 68 shows two houses which illustrate a rendering of two different values—gray and white. Here the materials such as shingles and siding are shown by halftone values and the trees, shrubbery, etc., made with lines further apart.

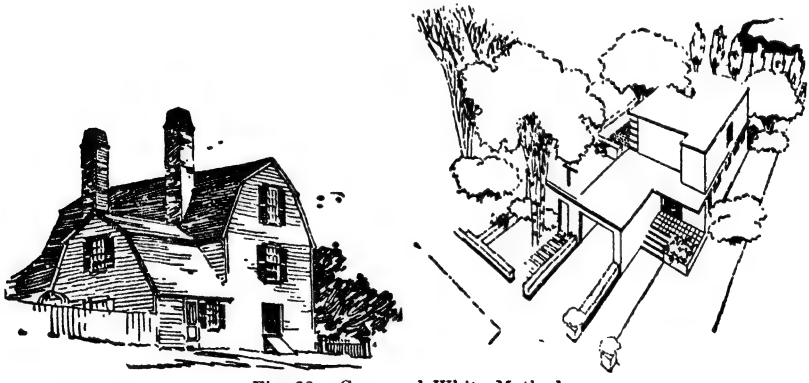


Fig. 68. Gray and White Method
Courtesy of Architectural Forum

Figure 69 has all three values—black, gray, and white. In studying Figs. 67, 68, and 69, there is no doubt but what 69 is the better because it combines the halftone effect with the contrasts of white and black. Therefore a safe rule to follow is, "Get into every pen rendering the colors black, gray, and white." The black in any rendering adds life and the student should try to get this color in

his renderings. There isn't a great likelihood of your getting too much in the rendering. Black can be used to bring out important features or to emphasize outlines, etc. Trees and bushes are often

Fig. 69. Black, Gray, and White Method
Courtesy of Architectural Forum

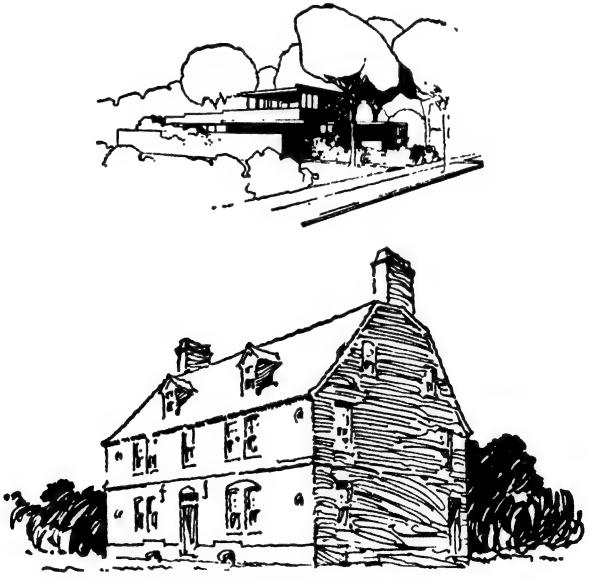


Fig. 70. One Side in Shade

treated in black to help show up the house as in Fig. 69. In other renderings such accessories as windows, shutters, window and door frames, lawn, sky, shrubbery, and shadows are treated in black. But in most renderings of today the black treatment is used for trees and bushes. When using the gray or halftone treatment, care must be taken so that the gray is not more than halfway between black and white. The black may be gradually graded off into gray or the

black and gray may be in distinct fields without any grading.

Lighting. The first thing to consider in the rendering of an architectural subject is the choosing of the direction of light. Sometimes when the building is turned well to the front, showing a sharp return of the end, it may be best to put that side in shade, but such practice is not necessary. See Fig. 70. Values may be obtained by

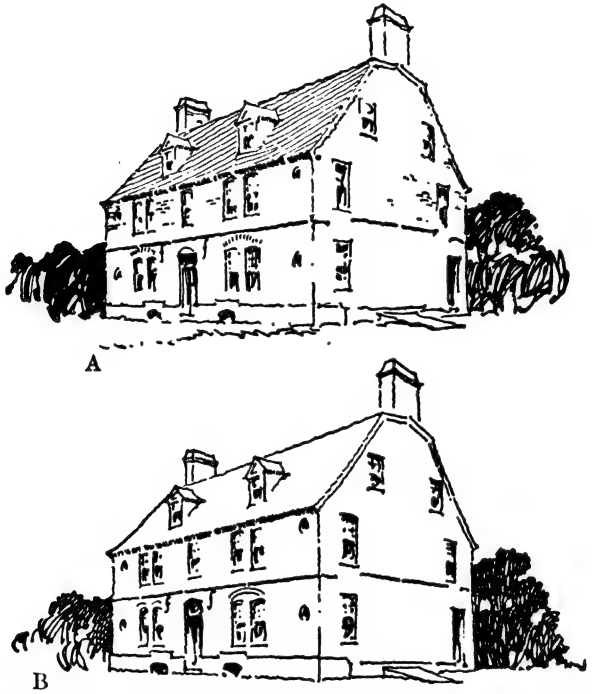


Fig. 71. All in Light with Halftone Value of Roof Shown at A and All in Light Shown at B

other means such as by shadows, or color of material. It is not often wise to attempt a heavy rendering in pen work. In most cases it is safer to keep both sides of a building in light and use black treatment for trees, etc. See Fig. 71.

Color of Material. One of the means by which values may be introduced into a rendering, is by considering the color of the material of which the building is constructed.

In the example, shown in Fig. 72, we may first use the brick walls as a place to locate a gray value. In the second example, Fig. 73, the roof is used for the same value. For the very dark or black

value we must depend on the shadows. Neither one of these drawings is wholly satisfactory. In the first, the roof, and in the other, the walls, seem too glaringly white. For that reason it is not always best to use the material color so broadly. To give color to both walls and roof would destroy the white value, and the white value must not be lost. Fig. 74, shows an attempt at a compromise. This has been accomplished by lessening the halftone on the roof and

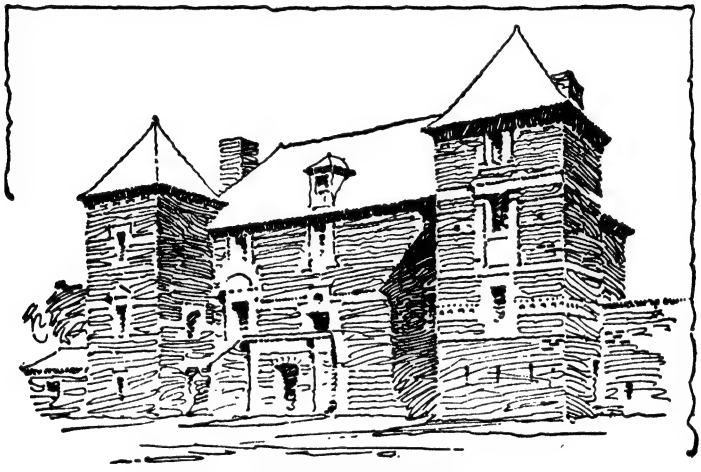


Fig. 72. Halftone Walls

adding a little to the side. The effect isn't as pleasing as the one shown in Fig. 73.

Shadows Only. The simplest means for obtaining values is by the use of shadows. Sometimes the shadows alone will complete a drawing in a very satisfactory manner, as in Fig. 75. Some houses are not favorable to this shadow treatment because they do not have porches or other projections sufficiently large to cast a strong shadow. In such a case a little accessory helps one out of the difficulty and a little rendering of the house material gives a needed halftone effect. Fig. 76 shows an example of this. A few parts of the siding have been rendered for the needed effect. This is a simple rendering and in most cases could be improved by some trees in black treatment. The contrast made by the black trees would create a more pleasing drawing.

Black Sky Treatment. Fig. 77 shows two methods occasionally used for rendering work. In both cases the solid black treatment

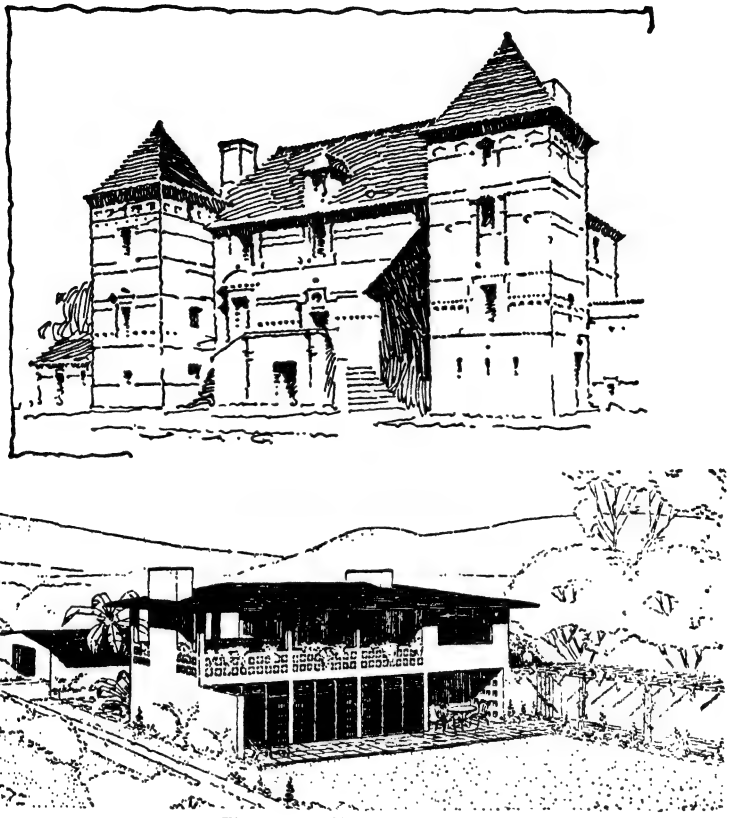


Fig. 73. Halftone Roofs
Courtesy of Architectural Forum

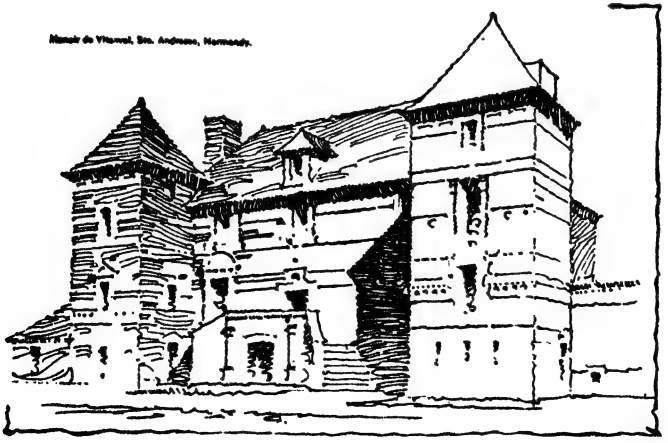


Fig. 74. Gray on Roof and Side

of the sky is used to bring out the lines of the houses and other intimate details. Fig. 77 A shows the way that is used generally for this method while at 77 B is shown a compromise method where a part of both sky and foreground is all solid black and a small

Fig. 75. Shadows Only

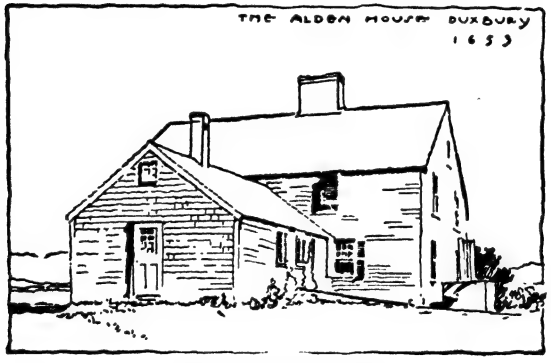


Fig. 76. Alden House

portion of the sky treated for clouds. When using either method shown in Fig. 77, special care must be taken to stretch the paper before putting in the solid black. Stretching is accomplished by tacking the paper on a drawing board so the tacks are about 1 inch apart and then wetting the paper and allowing it to dry. The solid black portions can then be put on with a small paint brush without causing the paper to bulge.

Principality or Accent. We now enter into a matter of composition. One simple rule will be given and there is none more useful.

Let there be one place in the drawing where a strong accent of black shall exist. It may be one black, or it may be a group of them. This accent will be found in nearly every illustration in this paper.

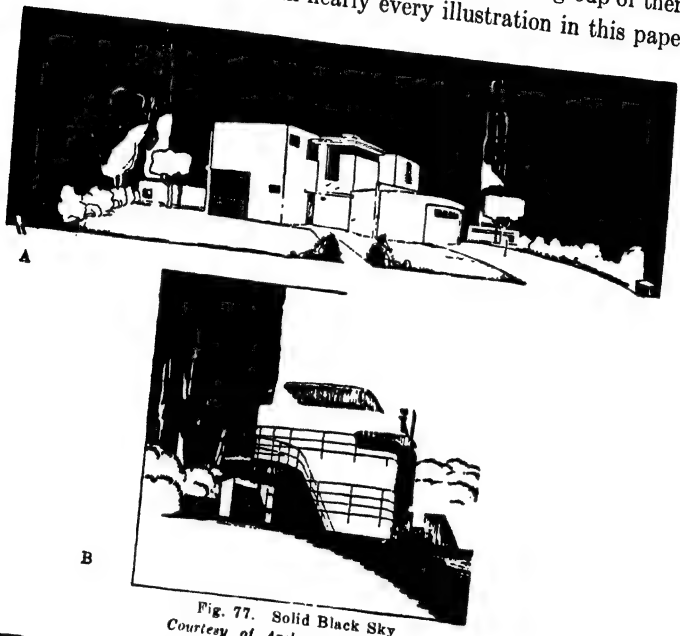


Fig. 77. Solid Black Sky
Courtesy of Architectural Forum

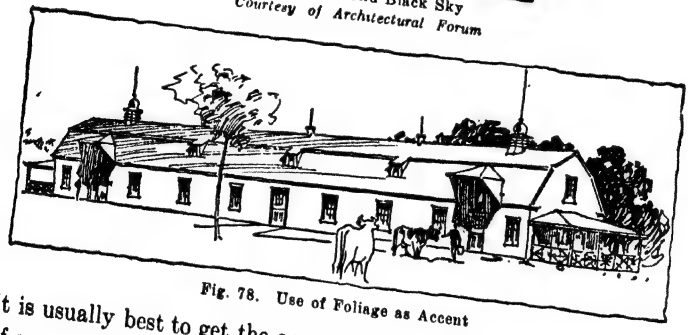


Fig. 78. Use of Foliage as Accent

It is usually best to get the accent in the building itself, by the aid of some large shadow perhaps, but when there is no chance for this it may be necessary to get it in an accessory such as foliage. This is shown in Fig. 78, a drawing of a barn. In connection with this black accent let there be a large white area if possible. A principal white, as well as a principal black is thus obtained. Most drawings permit the dark accent and the light area also. Fig. 79 is helpful

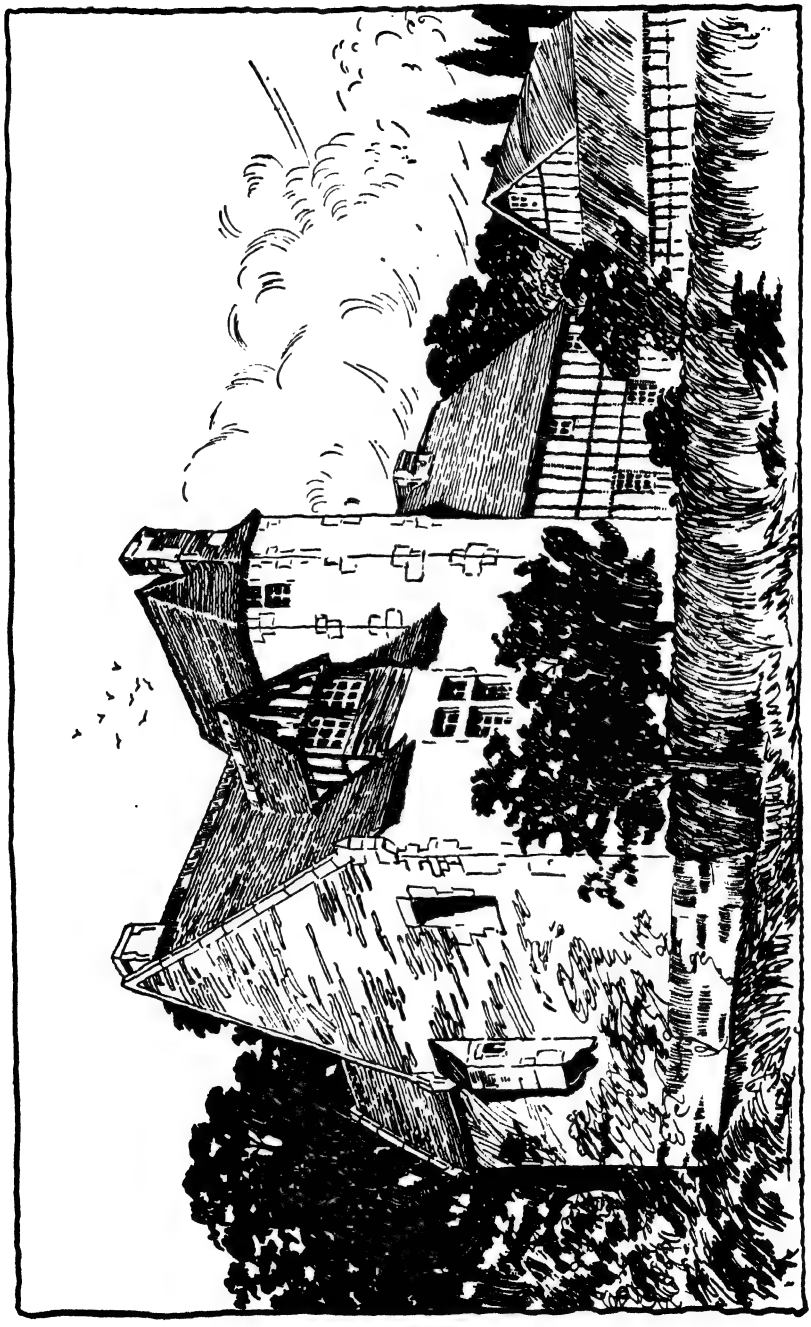


Fig. 79. Typical Rendering

to use in calling attention to some things in its composition.

The location of the dark accent is apparent in the trees at the left. The other blacks, the trees in front of the building and those down at the extreme right, simply repeat in diminishing force and size, this first dark accent. The light area of the drawing is as distinctly shown as the dark accent; in fact this large light is the feature of this rendering. The light brick rendering of the gable is necessary to confine the light a little more surely to the important portion of the wall. Also, if this light rendering were omitted, the building would appear unpleasantly white.

The halftone of the roof is necessary to give a soft contrast to the light wall surface. The sky has its use. Cover it up, and see how the whole subject slumps downward.

Last, but not least, observe that the corners of the drawing are kept free from rendering. This is usually safe. Let the rendering of every sort gather about the central object. The corners of a drawing may then be left to take care of themselves.

PENCIL WORK

A pencil is a quicker medium for the rendering of a sketch than a pen. A pencil sketch may be made directly on a sheet of drawing paper, and completed on that same sheet. But it is neater to first draw the perspective on smooth white paper, then place tracing paper over this outline, and trace and render. By this means all construction lines in the layout can be omitted, and the sunny edge of projectings can be left out, thus adding greatly to the brightness of the drawing.

Use a soft pencil for rendering, a BB or softer. If the drawing is to be much handled, spray it with fixatif. Trim the sketch, lightly gum the corners, and lay the sketch on a white card with a good margin.

SUMMARY

The following summary of advice for the rendering of work generally, with pen or pencil may be found helpful.

1. Consider the direction of the light.
2. Discover in the outline before you, the opportunity for a leading dark accent.
3. Look out also for the location of a large light area.

4. Put in shadows.
5. Get at least three distinct values; black, gray, and white.
6. Consider the color of roof or the wall, and if necessary use one of them or portions of each for a gray value.
7. Use a very free method.
8. Keep rendering out of the corners of the drawing.

PRACTICE WORK

Methods. Now, that the basic principles of rendering are known, the next step is to actually study and practice methods. To do this we will first study Fig. 79, then carefully study the technique of the line work for the various parts of the drawing, and finally practice the line work and the complete drawing. As stated previously in this material, practice is absolutely necessary. Once the principles are understood the matter of actual practice becomes all important. Good work cannot generally be accomplished soon. But if the student will practice patiently and carefully, his work will gradually approach perfection.

The light, in Fig. 79, comes from about the same direction as the line of sight, or, direction from which we view the house. All walls have been thus kept in the light and no shadows have been drawn. The dark accent is accomplished by trees and bushes according to one of the best practices. Having trees and bushes dark and the sides of the house in the light, create a perfect contrast and makes the house stand out more clearly. The sides of the house in this case form a large light area as does the sky. Sometimes a rendering looks better without shadows. This is the case in Fig. 79, because of the dark accent obtained by the trees and bushes. To draw in shadows here would steal away some of the simple contrast and make the rendering "overdone." The three values, namely, white, gray, and black have been beautifully obtained using white for the sides of the house, gray for the roof, and black for the trees. Observe how the black accent is gradually carried to a gray near the edges of the drawing. The roof, if left white, would have made too much white and would not have created a dividing line between walls and roof. The house would have appeared listless. The gray or halftone effect has given the drawing of the roof real character and life. Because the sides of the house were large and white, it

was decided to show some material. Thus, a few stones were rendered at random, and the panelling was shown in the rear portion of the house.

The student should particularly observe that the rendering looks anything but sharp, hard, or mechanical. All lines have been drawn freely without the aid of instruments. At no point has it an overdone effect. The student should endeavor to acquire an eye to prevent overdone effects and at the same time give the completed effect to a rendering. Fig. 79 looks like a picture because nothing seems left out. The method used was free and the lines are all either slightly curved or wavy. Yet they are firm, unbroken, and lack any trace of mechanical effect. It should be noted, too, that rendering is not done down into the corners of the border lines.

Trees. Perhaps the most difficult of all rendering has to do with trees. Beginners are apt to make trees that lack the lifelike appearance. For this reason trees should be studied as to their main outlines. The student will do well to save all examples of tree rendering he encounters and to practice until he can outline trees like the examples. Also living trees can be sketched and this practice continued until the sketches give an accurate impression of the trees. A tree can be divided into two classes, namely, trunk and upper or bushy portion. Generally, perspective renderings show mostly only the bushy parts of trees, as was done in Fig. 79. But there are times when trunks and limbs are necessary. Examples of both parts of trees will be studied after which the student can go about practicing on scrap paper first with pencil and then with ink.

We will now look at the tree portion of Fig. 79 and study it. Observe the two trees in the middle of the drawing just underneath the dormer in the roof. These trees have been rendered in simple manner using a free method. Fig. 80 shows four steps that will be helpful to the beginner. At Step A is just an outline of the trees which should be made lightly in pencil. The outline of the hedge underneath them is given to help the student place them in Fig. 79. From a previous part of this text, we learned how to draw a pencil outline of the house in perspective. When this has been done, the outlines of trees, etc., can be lightly drawn in. Tree outlines can be made from imagination and worked with until they look well, or they can be made while looking at actual trees or pictures

or sketches of them. Thus, Step A, as shown in Fig. 80, is the first thing for the beginner to do in rendering the trees.

Step B in Fig. 80 shows the start of the rendering. Study the line curvatures and various general directions. Note how lines running in different directions are drawn up to one another and that all lines are definite, unbroken, and absolutely free from any me-

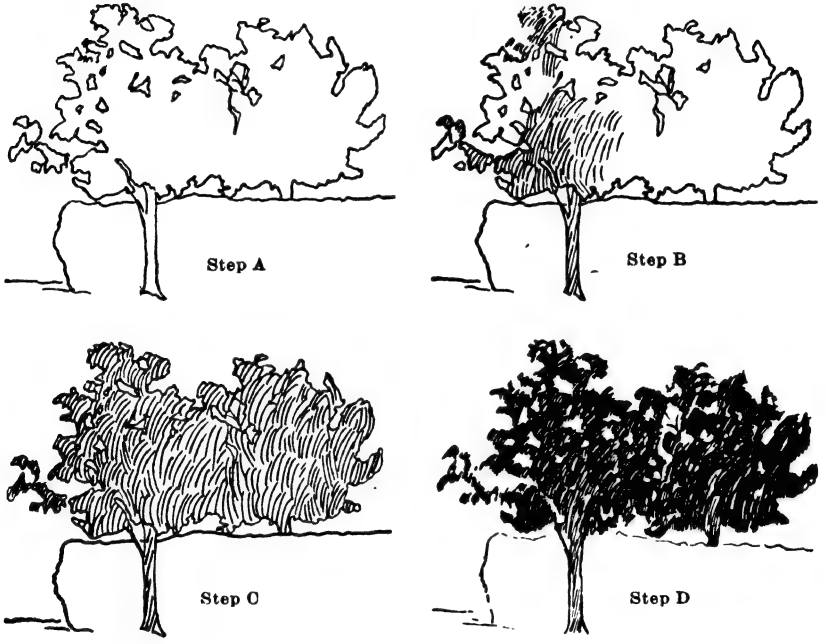


Fig. 80. Four Steps to Follow in Rendering Trees

chanical appearance. The student will do well to make his lines far apart, too, at the beginning. The lines are heavy because these trees are to form part of the black accent in the completed drawing.

Step C in Fig. 80 shows both trees completely filled in with the same free method as started in Step B. At this point the pencil outline can be erased. Note the trunk of one of the trees. It really appears like a tree trunk because it was drawn by carefully studying existing trees or photographs or other drawings of trunks. The student may well spend considerable time in practicing trunks. Use a soft pencil and work over and over the sketches until they resemble real trunks. Only practice will accomplish ultimate perfection and ability, but it can be done if the student will keep at it.

Step D shows the completed rendering of the trees. This has been accomplished by continuing the work of Step C. This means that in Step C we continued by adding many more lines. Each line added to Step C was drawn in the same direction and at the same curvature as the line next to it. In other words, there are groups of lines of various directions and curvatures in Step C. We continued by taking one group at a time and adding more lines to it. We built up the dark accent by drawing heavy lines, one line next to and touching the other line. The degree of black or gray desired is obtained by the number of lines, by their spacing, and by the weight of each line. To create black accent we use very heavy lines drawn next to each other. To create gray accent we would draw the lines further apart and use a lighter line. Also in creating black accent the opening among the leaves is kept down to a minimum. A few more lines are added to the trunk to give it a gray accent. It must be gray in order to stand out when surrounded by black accent.

PRACTICE PROBLEMS

The student should now go about serious practice on trees. It is advised that the outline in Step A in Fig. 80 be drawn at least twice or three times the size shown. Then practice Steps B, C, and D. Do this many times. Do it until your drawings of the various steps look as good as those shown in Fig. 80. Remember that practice is all that will help.

Roofs. This part of a rendering generally occupies a conspicuous part of the drawing and therefore is important. The rendering is not difficult if carefully done.

In Fig. 81 are four steps which illustrate this rendering. In Step A we start with the outline which is made or traced from the pencil perspective as explained previously. Note that no long solid lines have been used and that the lines are all freehand. A medium weight line should be used and especially where the roof is to be gray in accent. Study the lines and practice them until you can make lines like them.

In Step B of Fig. 81, some of the roof rendering is shown. The lines were spaced far apart to show clearly their characteristics. Also, by spacing the first drawn lines far apart, we can carefully add more lines until the desired gray accent has been accomplished.

These lines are all wavy, unbroken, of various lengths, and more or less parallel. To distinguish between cornice details and other roof areas, the line directions are changed. Shadows are drawn with a change of direction. All lines are simple and freely made by free strokes of the pen.

Step C shows a continuation of Step B. Now the entire roof

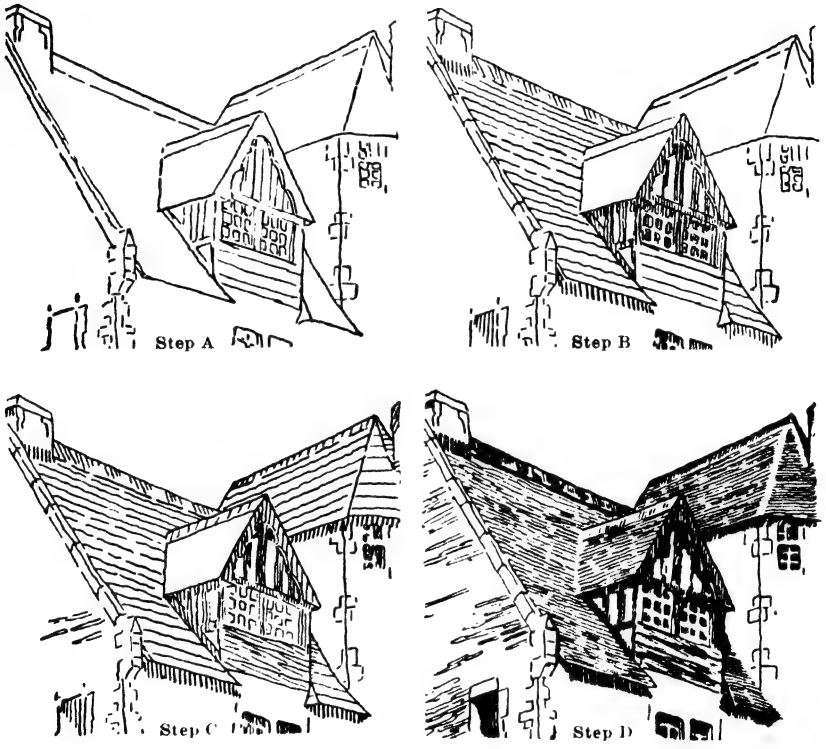


Fig. 81. Four Steps to Follow in Rendering Parts of Buildings

and dormer have been partially rendered. Study the lines at all points. Note their directions, curvatures, and wavy tendencies.

In Step D we have erased all pencil outlines and added more lines to the rendering. Close examination will prove all lines in Step D to be exactly like those in previous steps. The student is advised to make a most careful study of these steps and the lines composing them.

After a most careful study of Fig. 81 the student should copy Step A three or four times as large as shown in the text, and then

practice Steps B, C, and D. Practice making the lines on scrap paper and finally on your sketches. Many trials should be made and the practice continued until you are satisfied that your work looks as well as the drawings in Fig. 81.

Miscellaneous. The hedge, which runs along in the foreground of Fig. 79 is made with rather long slightly curved lines. These lines are not wavy, as in the roof, but are long curves. The direction is changed now and then and the lengths of the lines changed here and there. It will be observed that the hedge has a gray accent. This has been accomplished by using less heavy lines, than in the trees, and spacing the lines further apart.

The roof method of the part of the house at the extreme right of the drawing has been changed from that of the main roof. This is a matter of individual taste. However, the smaller roofs to the right are of less importance and are drawn as shown so as to be secondary in appearance. The lines used are light and widely spaced so as to give a light gray accent. They are fairly straight having the top ends the most pronounced. Each line is a definite stroke of the pen, unbroken, and firm.

The panelling effect on part of the wall is accomplished by drawing quite long and slightly wavy lines very close together. The weight of line controls the effect. The cloud effect is created by drawing mostly short and slightly curved lines in a free method. Material effects are gained by rendering a few stones here and there more or less at random. The beginner must take care not to draw in too much material which would rob the walls of their white accent.

As has been repeatedly stressed, success in rendering can only be accomplished by a great deal of practice. This practice must be slow and deliberate. Practice individual lines, groups of lines, and whole surfaces. Do not be discouraged because success does not come quickly. To render well in ink is an accomplishment requiring patience and hard work, but when mastered, it marks one as an artist and enlarges his field of architectural ability to a point much nearer final success. Such can be accomplished by practice.

PRACTICE PLATES

In all of the following practice plates, the student is advised to start out by using a soft pencil. Once the pencil has been mastered ink can be used. Never put both pencil and ink on the same rendering.

Plates XVI to XX inclusive are given to assist the student in practice work. The first two of these plates are simple but the latter plates, and especially XX, are really difficult and will require considerable practice and care.

To practice these plates, the student can secure a medium thin piece of bond paper, put the paper down tightly over one after the other of the five plates and lightly trace the outlines. The use of a bond paper is specified because bond paper takes pencil and especially ink very well for such purposes as rendering. When tracing these plates, which can be easily done with light bond paper, trace only the outline. Do not attempt to trace the rendering. Your tracing should resemble Plate XXI which is a tracing of Plate XVI. As many tracings as required for practice can thus be made from all five plates given.

The student finally after having practiced all five plates first in pencil and then in ink could very advantageously redraw these five plates two or three times as large and then render the enlargements.

For other exercises the student may try his hand at adding a few trees, bushes, etc., to such Plates as XVI and XVII. The student can practice various accents for various parts of the buildings, too. A careful review of the whole text is advisable now and then in order to keep before you essentials of the principles.

One can, also, practice other examples found in magazines, newspapers, etc., and actual scenes from your own locality.

A measure of your success can easily be had by comparing your work with the plates shown in the text or other renderings found in magazines, newspapers, etc.

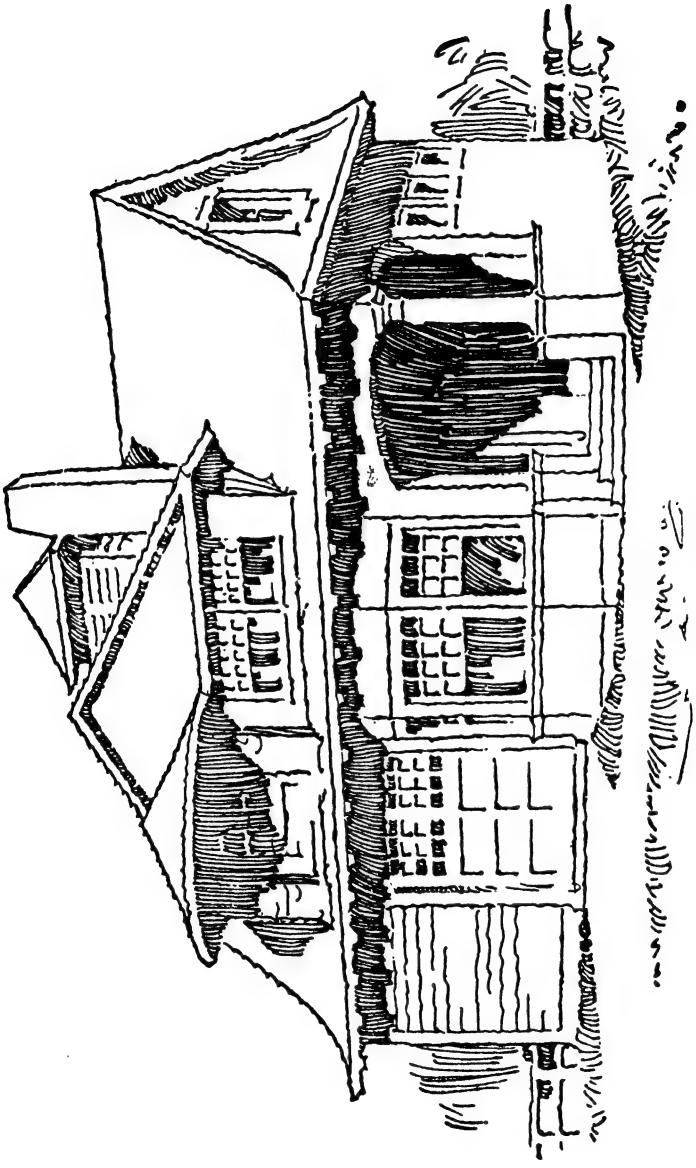


Plate XVI. Finished Drawing

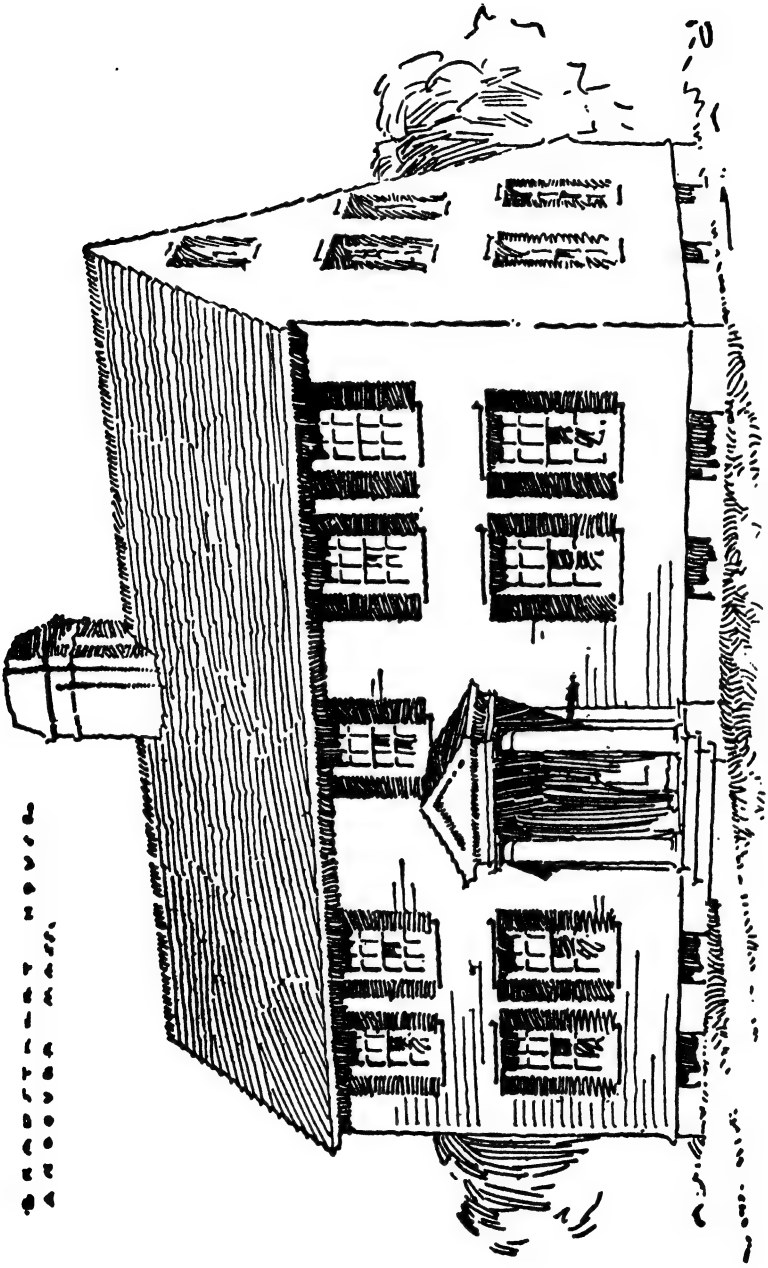


Plate XVII. Finished Drawing

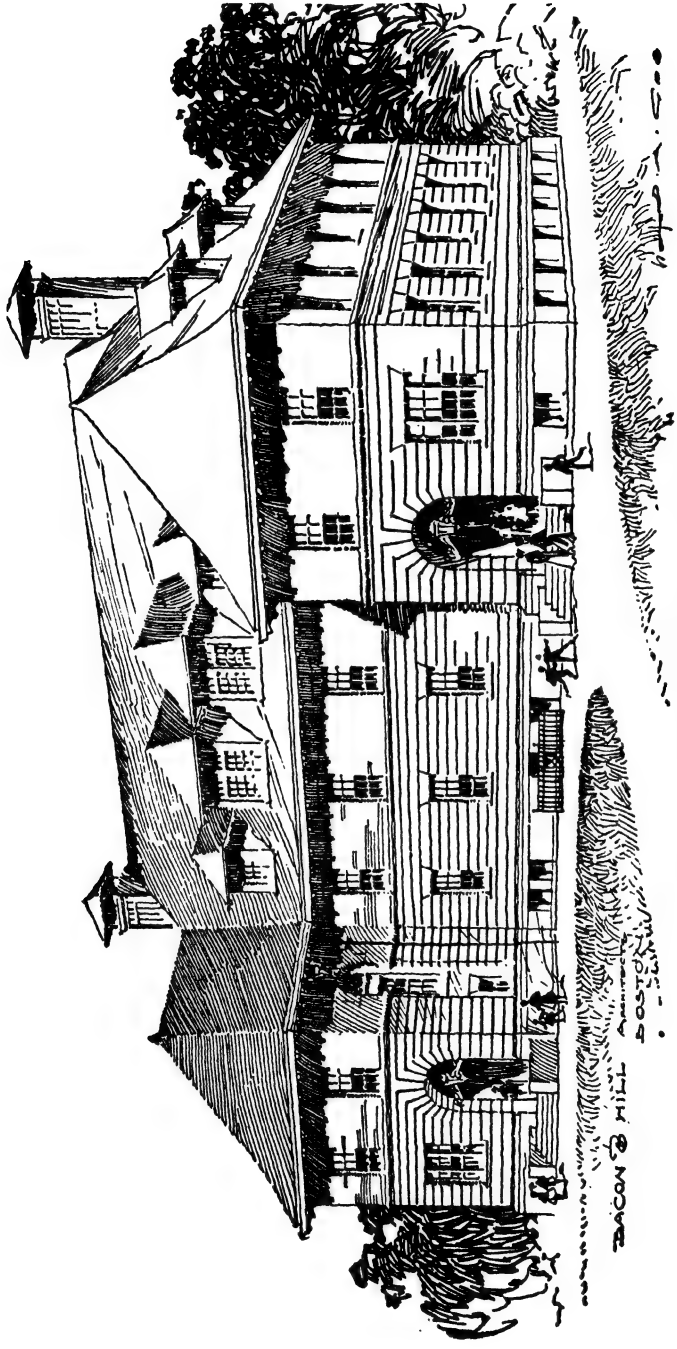


Plate XVIII. A study in pen and ink rendering

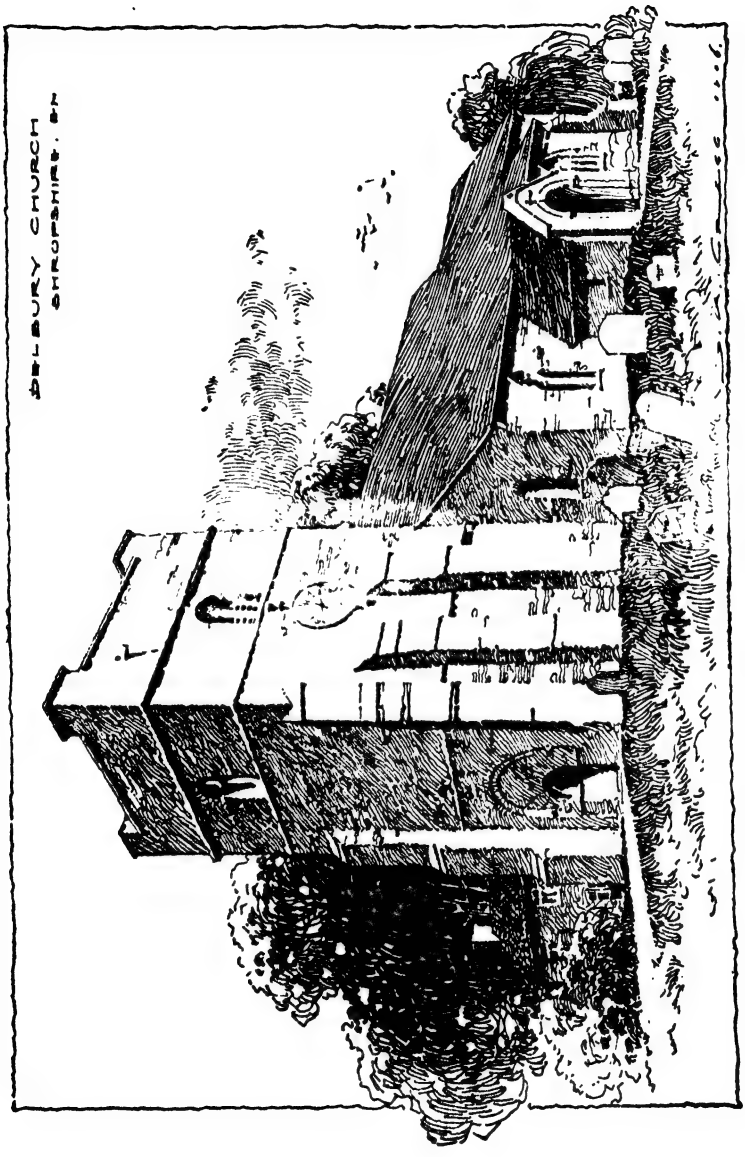


Plate XIX. A study in pen and ink rendering

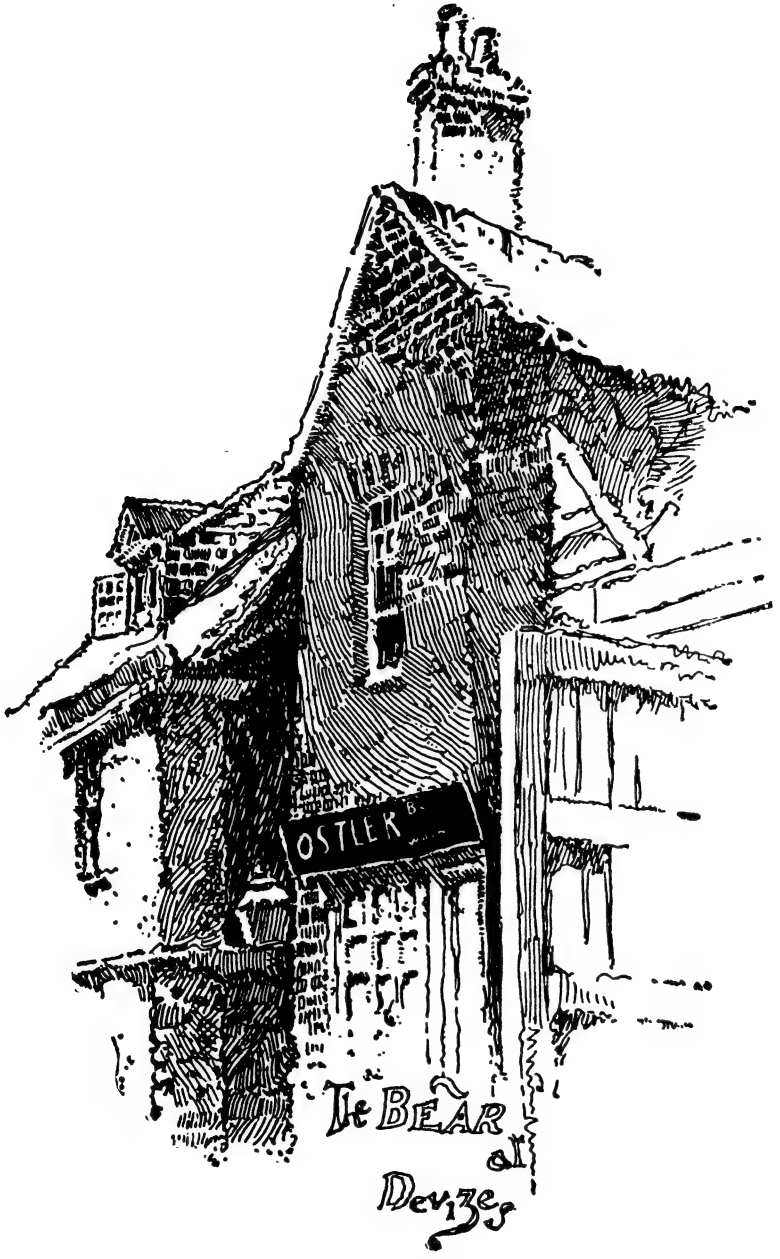


Plate XX. A study in pen and ink rendering

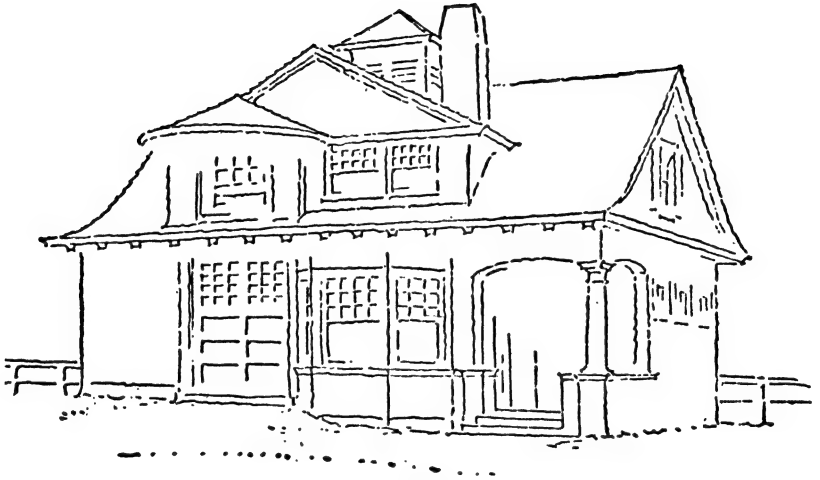


Plate XXI. Illustrating How a Tracing of Plate XVI Should Appear, Before Rendering Practice Is Started

LANDSCAPING

Purpose. Figs. 82 and 83 illustrate landscaping in the ordinary sense of the word and usage. Drawings such as these have several uses, the foremost being in the order of their importance as follows: First, to lay out or design the entire lot; second, to show a client just how his house will be situated on his lot and to serve as a selling feature; third, to set forth dimensions; fourth, as a guide for purchasing shrubs, trees, flowers, etc.; and fifth, to instruct excavators where to dump or not to dump excavated earth.

Under the first usage comes the actual design feature of planning the best position of the house on the existing lot. The position is chosen after considering sunlight in and around the house; drainage; accessibility for walks and driveways; beauty; special uses of lots for gardens, tennis courts, etc.; main street entrance, etc. An architect can generally ascertain such items in talking with and questioning his clients. The house and various other items on the lot can be carefully drawn to scale trying several arrangements, if necessary, until one is chosen that is best suited for the various needs and desires of the client.

The second usage finds importance as a selling feature, for a lot well designed appeals to a client. Also, such a drawing shows him exactly how his lot will appear when fully completed and affords him an opportunity to better visualize the whole and thus be in a better position to offer his own ideas and help the architect in his design. A landscape drawing used in connection with a pen and ink rendering serves to display the future of the architect's plans almost as well as an actual photograph.

Under the third usage comes the opportunity to show as many dimensions as are required to enable tradesmen to ascertain exact locations of such items as garages; sidewalks; house positions; placing of trees, shrubs, etc.; fences, and any other items requiring accurate placing to keep the lot well balanced. Trees already on the ground can be shown and used for dimensioning purposes. If such dimensions are not shown on the rendered landscape draw-

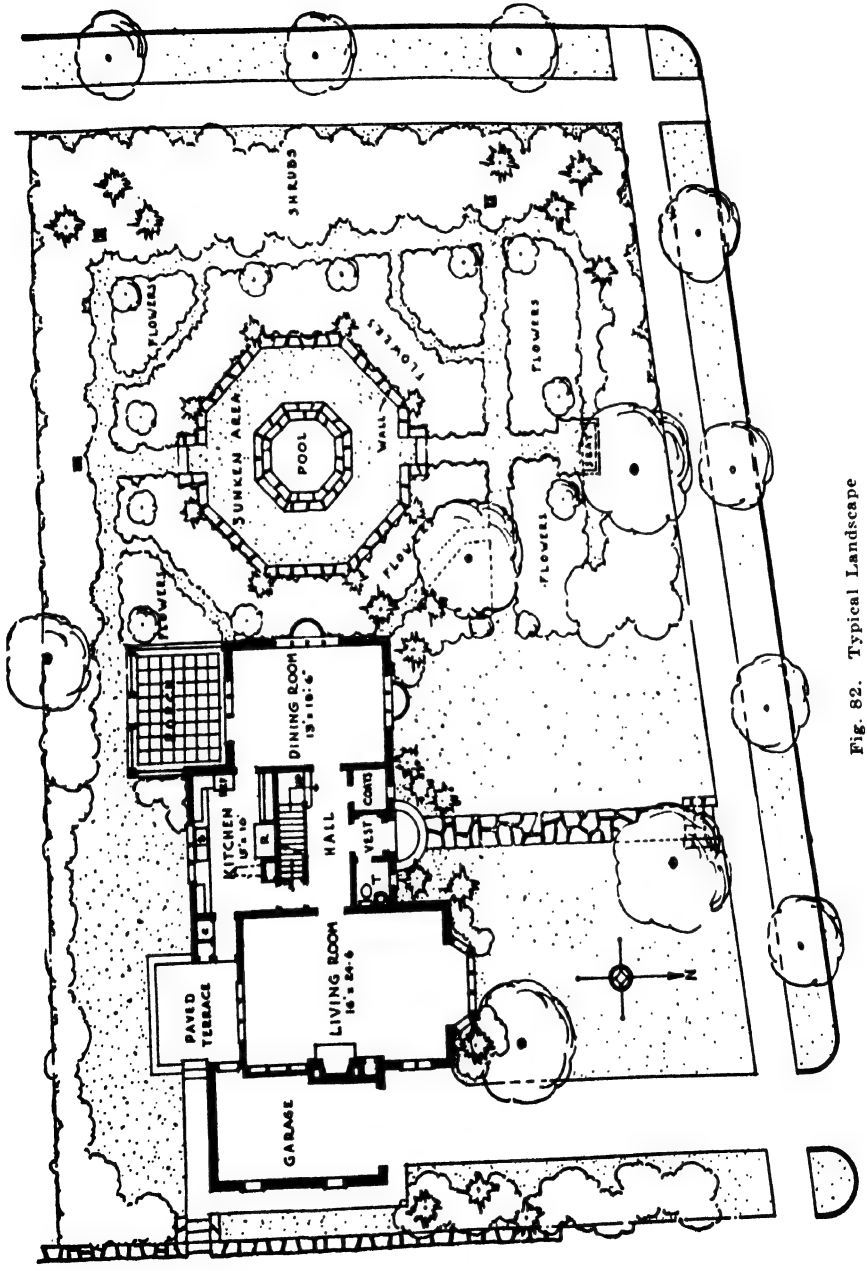


Fig. 82. Typical Landscape

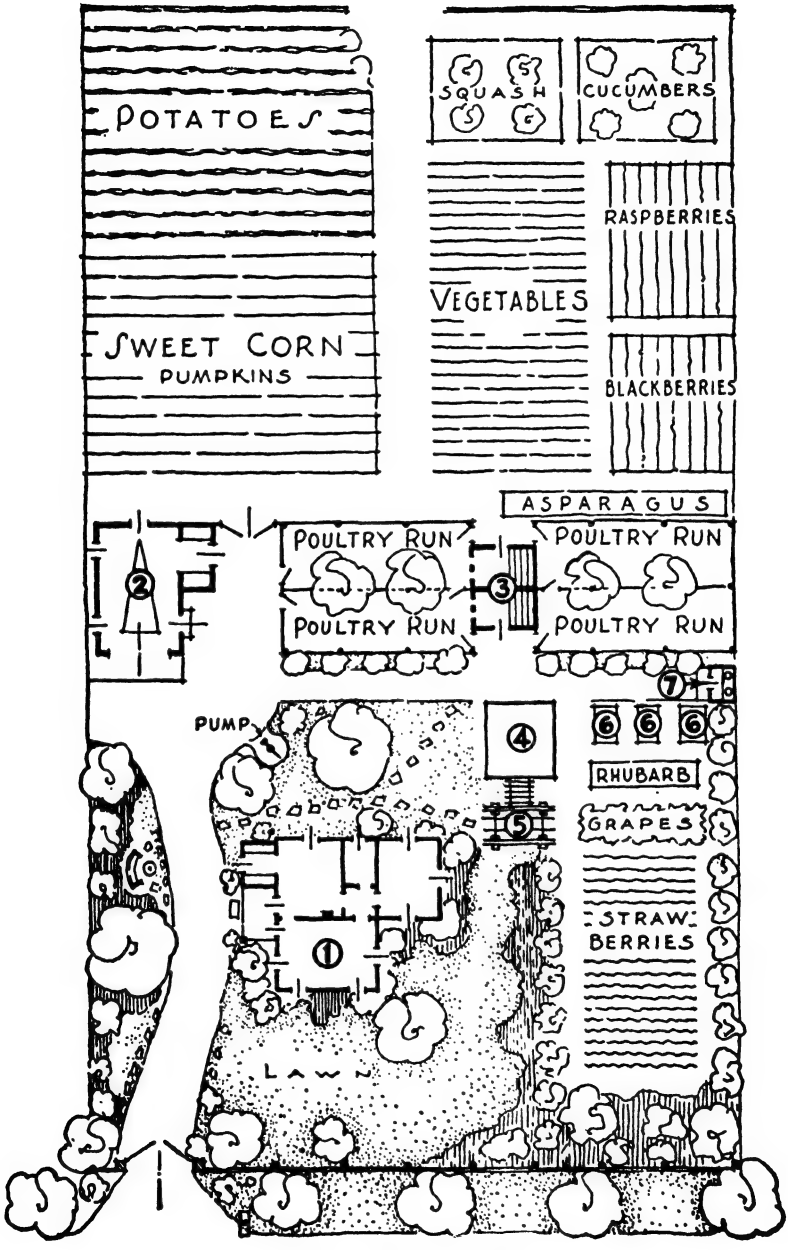


Fig. 83. Typical Landscape
Courtesy of American Builder

ing, then another working drawing must be provided for that purpose.

The fourth use is for a guide in purchasing and estimating costs for all plants, etc., as indicated. Also driveways, sidewalks, and other mechanical features can be estimated from such a drawing.

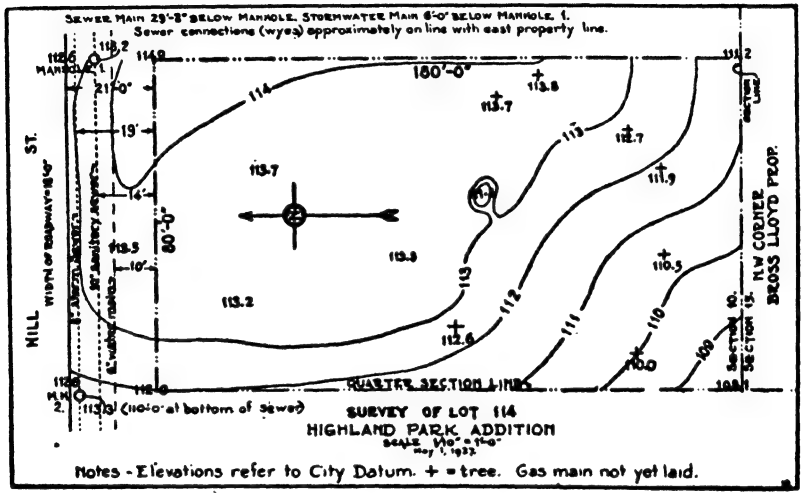


Fig. 84. Typical Lot Survey

The fifth usage is important because the earth excavated from basements has to be disposed of in some manner. If the lot is irregular in elevation and requires some filling, then the drawing can be used to show the excavator exactly where to dump.

It often happens that a client plans to set out his own flowers, trees, grass, etc. Here the landscape plan is useful, also, because it gives him a very definite plan to work from.

It should be explained here that an architect is generally provided with a survey of the lot which shows contours, locations of trees, pipe lines, curbs, etc., and from this he can go ahead with the landscape drawing. A contour is a continuous line every point of which represents a certain elevation or height. Note Fig. 84. Here is shown a typical survey of a lot. At this time we are interested only in the contour lines. Note the curved lines. Find the line marked 113. Every point on this line is 113 feet above sea level or, in some cases, above some known point of elevation in the town or country side in which the lot is located. Find the line marked

112. Every point on this line is 112 feet above sea level. In like manner every point on lines marked 110 and 109 is 110 feet and 109 feet above sea level. These drawings are made to scale accurately. For example Fig. 84 is scaled $\frac{1}{10}$ inch = 1 foot. From line 109 to line 110 there is a difference of 1 foot. In other words all points on line (or contour) marked 110 are 1 foot above or higher than the points on line 109. So all points on line 113 are four feet above all points on line 109. The distance between contours is generally about 5′-0″ to 10′-0″. This can be shorter in hilly country. Thus the architect sees that the lot slopes gradually between lines 113 and 109. Between lines 113 and 114 the distance is great and the difference in elevation only 1 foot so that means the slope is very gradual or gentle. This area then would be a good place to put the house unless other circumstances entered into the problem. The "+" marks show locations of trees and the elevation at the place where the tree trunks enter the ground. The location of the trees can be scaled according to the scale shown.

Thus, with a survey of the lot at hand, the architect can easily select the best place to build the house and can plan the landscaping to the best advantage. Natural drainage can be planned; disposal of excavated earth specified; all driveways and walks laid out; and full advantage taken of any existing trees, etc.

If a lot is flat or only gently rolling or sloping, the architect can combine the dimensions for location with the landscape very easily, as already explained. However, if the lot has a marked degree of slope, a separate plan called the Location Plan is necessary. In this plan are shown the contour lines, which are taken from the survey drawing (Fig. 84), all dimensions locating main corners of the house, other dimensions locating and specifying widths of driveways and sidewalks, and instructions as to where to put the excavated material. Then the landscaping has to be drawn separately. See Fig. 85 for an example of a typical location plan. Here no pretense was made as far as beauty of drawing is concerned. The outline of the house, drives, and sidewalk are shown together with all locating dimensions, contours, and limits for the excavated material as shown by the shaded line. A drawing to show landscaping would have to be made in addition to Fig. 85.

Sometimes, for exhibition or for other show purposes, landscape

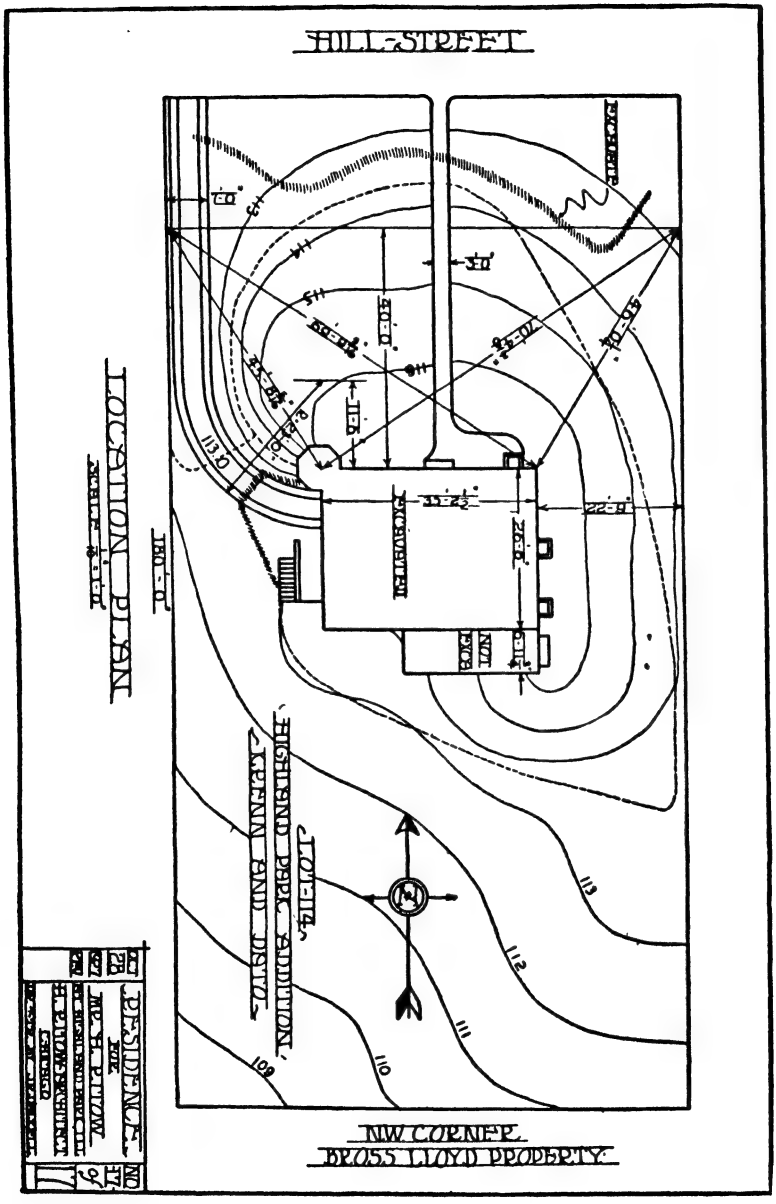


Fig. 85. Typical Location Plan

drawings are made without dimensions. But, in general, a set of plans for ordinary use contains the landscape plan fully dimensioned, or, only dimensioned in regard to size and location of shrubs, trees, gardens, etc., and then supplemented by a location plan. This latter plan is best as it makes each drawing easier to make and read.

LANDSCAPE SYMBOLS

The symbols used on landscape drawings are typically the same as those used on working drawings. There is a symbol for trees, one for shrubs, grass, etc. A careful study of Fig. 86 will acquaint one with the symbols used most.

Numbers. Numbers are sometimes put on a drawing such as in Fig. 83 so that these points can be referred to in the written specifications or so that detail drawings can be referred to these places. This practice is all right and serves a good purpose.

Note.—The numbers found in Fig. 86 were put there only to better call attention to specific points in this explanation.

Trees. The numeral 1, in Fig. 86, points to examples of tree symbols. It will be noted that these symbols are round, or nearly so, and a large dot or small circle indicates the position of the trunk. The size of the symbol (its diameter) gives evidence of the approximate size of the tree, or, what its future size is expected to be. The outlines of these symbols are wavy and slightly irregular. There is no hard and fast rule for these symbols and a very free method can be used in drawing them.

Bushes and Shrubs. The numerals 5, 6, 8, and 11 indicate bushes and shrubs. The size drawn indicates the expected size on the actual landscaping. These are drawn somewhat irregular and great freedom is allowed.

Walks and Drives. The numbers 7 and 10 indicate symbols for walks and drives. They are generally outlined with a solid line or by bushes, trees, and shrubs. The symbols are left white except as used for the name sidewalk or drive and the necessary dimensions. This applies only where concrete is the material.

Flagstones. The numerals 2, 3, and 4 indicate flagstones. In such cases as at 2 and 3 where the stones form a terrace or walk, they are shown as all sizes and shapes. The joint between each stone is made noticeable. The edges of walks or terraces are not outlined

other than by the stones themselves. At 4 is shown a flagstone path. These stones serve as stepping stones or an abbreviated walk.

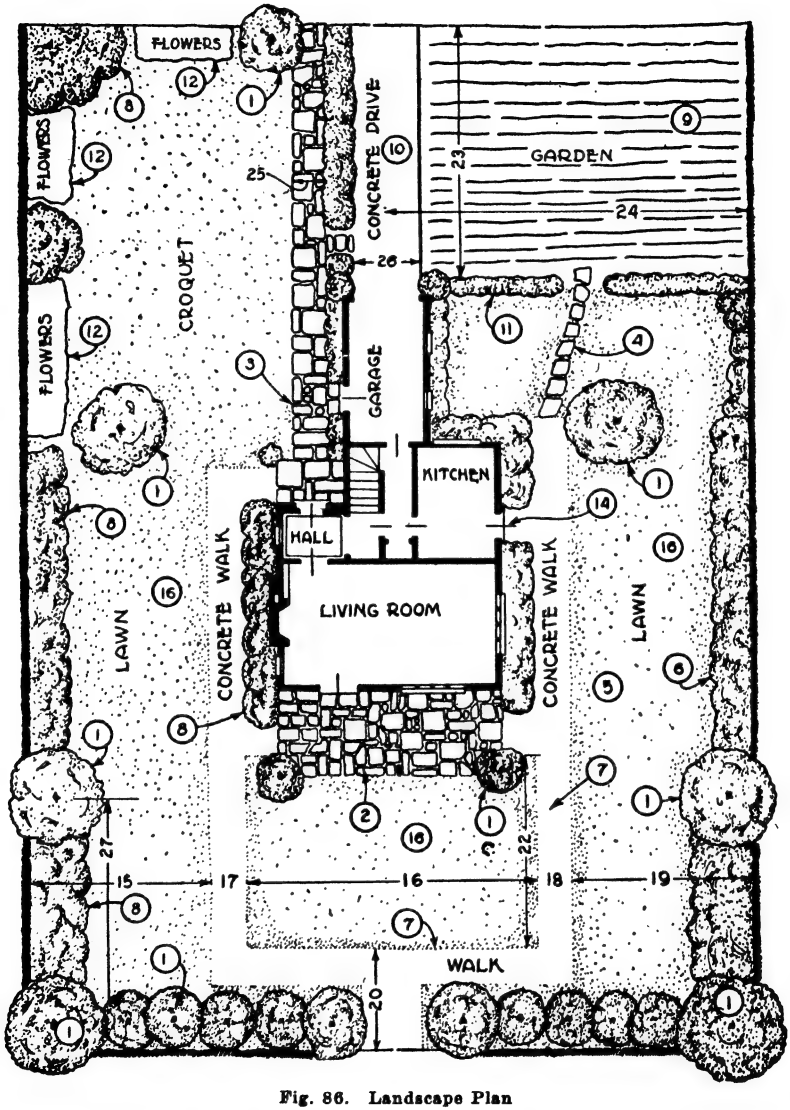


Fig. 86. Landscape Plan

Various shaped stones can be used where no joints need be made.

Gardens. The numeral at 9 indicates the garden symbol. The lines are irregular in length. If the garden is going to be at

all large, it is best to go about drawing it as shown in Fig. 83.

Flowers. Flower patches are indicated at 12. These are mostly regular shaped plots indicated by a slightly irregular outline. The name of flowers can be indicated.

Floor Plan. Floor plans are drawn accurately to scale. Generally the $\frac{1}{8}'' = 1'\text{-}0''$ scale can be used. The first floor is always shown. The room names, room dimensions, door and window symbols, sometimes furniture, and such other items as required are shown. The walls are generally drawn black. Window and door symbols are made very simple with or without detail.

Fences, etc. Where fences, arbors, etc., are to be built, a simple plan view of them can be drawn. The details will be elsewhere. Fish ponds, rock gardens, etc., are generally either flagstone or concrete and can be shown such as numerals 10, 7, and 4 or 2. Outdoor furniture is shown by plan view.

Grass. Numeral 16 indicates grass. This symbol is of random dots made lightly to give a halftone effect.

Miscellaneous. Other symbols as may be required, such as tennis courts, etc., can be drawn in plan view and indicated by name and dimension.

DETAILS

Scale. It is necessary to make landscape drawings by using a small scale as they show a plan of the entire lot. Generally, the $\frac{1}{8}'' = 1'\text{-}0''$ scale or $\frac{1}{16}'' = 1'\text{-}0''$ scale is used and everything in the drawing made to that scale. The plan of the house or building is accurately drawn, and such items as sidewalks and driveways are drawn also accurately. Items such as trees, bushes, and shrubs can be made only approximately what their ultimate size will be. Flower beds, gardens, tennis courts, etc., can be drawn in accurately. The completed drawing will then give the relative sizes and spacing of the objects on the lot accurately and thus serve as a dependable guide.

Location Plan Scale. When drawing location plans, the same scales are used as specified above. The contour spacing is accurately drawn and determined from the survey drawing. The buildings, driveways, walks, excavation limits, etc., must be accurately shown. Fig. 85 shows all important dimensions.

Dimensioning. Fig. 86 shows the most important dimensions

for a landscape drawing. We will assume the position of the house to be given on a location plan.

Certain items need not have dimensions, being at points where other items are already. For example, the two trees at the corners of the terrace need not have any dimensions as the terrace location is known and will probably be in place before the trees are set out. In like manner, bushes around the house or at the edge of the lot need not be dimensioned because those points are already known.

Note dimension number 27 in lower left-hand corner. This locates a tree. This automatically means a new tree is to be set out there and the dimension is given from the front line of the lot. Trees already growing need not be dimensioned. The width of the sidewalk is given by such a dimension as at 17 and 18. The location of the sidewalks is given by dimensions at 15, 20, and 19. Lengths of sidewalks, other than as shown, need not be dimensioned because of existing items. For example, the sidewalk on the left side of the house goes back only as far as the rear edge of the flagstone terrace by the entrance. The dimension at 25 would give width of the flagstone walk. Its length is obvious. Dimensions at 24 and 26 control the location of the driveway. The garden is controlled by the driveway and a dimension at 23. The flagstone footpath needs no dimensions because its location is obvious. The floor plan needs only room sizes as shown.

Location plans, such as Fig. 85, require accurate dimensions to locate the house, drives, sidewalks, etc. The dimensions used to locate the corners of the house are taken from the points shown. Walks and drives should be dimensioned as shown. The overall dimensions for the house should be given.

In general, on both landscape and location drawings only such dimensions as will be needed by tradesmen need be given. This can always be decided if the designer will question himself as to what the various tradesmen will need in dimensions.

MAKING LOCATION AND LANDSCAPE DRAWINGS

Location Plan. We will assume that as architects for a new home we have been provided with a survey of the lot. See Fig. 84. This survey may reach us in the form of a blueprint, or photo-reproduction, or a pencil drawing. In studying it, we find that

there is considerable slope toward one corner and there are several existing trees in the rear part of the lot. We can further assume that the owner has expressed a desire to retain all of the trees; have his house face Hill Street, and so placed as to obtain the best natural drainage; and to have a garage included in the residence structure. The lot is to be fully landscaped and provision made for a small garden.

After careful consideration, we decide to first make a location plan which will show dimensions and especially the excavation dump limits. Next, we will make a landscape to show all landscaping proper. The floor plans are made considering the facing on Hill Street.

The survey indicates that the best location for the house will be in the large almost level area of approximately 113 feet. This gives perfect drainage, allows the front edge of the house to be fairly near the street and thus makes a long driveway unnecessary. Rainwater or melting snow will run off the area around the house quickly in a south-westerly direction thus preventing basement seepage and making expensive foundation waterproofing unnecessary. Also the excavated material can be scraped out in front of the house area and be distributed in a manner that will improve and level off the front yard but still leave a slight slope which is desirable.

Fig. 85, the location plan, can now be drawn. A scale of $\frac{1}{16}'' = 1'\text{-}0''$ is chosen. The contour distances in Fig. 84 are scaled and made the same distance apart on the location plan. Each contour line must be drawn by locating several points by means of scaling. The outline of the house is next drawn in its proper position and the locating dimensions put in. Next, the driveway and walks are drawn and dimensioned. Finally, the grading is shown. The shaded line is the limit or extent of the dumping radius. After the house is partially complete, final grading can be done. The dotted line indicates the area where excavated materials can be used, in addition to grading, to make the area enclosed almost level. The house appearance is thus improved by being on what is an approximately level area at the top of a slope that falls toward the southwest, for example, at the rate of $4\frac{1}{2}$ feet in 60 feet. Such a plan allows perfect landscaping. This location plan can now be used by the city Zoning Department and contractor who does the grading.

Landscape Drawing. To simplify drafting the landscape drawing can be drawn to the same scale as the location plan and to some extent be traced from it. The borders can be lightly traced in pencil. The outline of the house can be traced after which the walls, partitions, doors, windows, and main dimensions can be drawn as shown in Fig. 86. Driveways and walks can also be lightly drawn. The existing trees, as shown on the survey (Fig. 84), must be shown by their proper symbol. The size of the symbol must be close to scale as decided by actually studying the size of the trees. Next, select the site for the garden. It can be put to advantage on a sloping lot as near the top as possible without being too prominent from the front of the lot and shaded much from the trees.

The laying out of shrubs, bushes, flower patches, rock gardens, flagstone walks, etc., can now be carried on and worked with until a satisfactory arrangement has been accomplished and which blends well with the existing trees, the house, direction of sun, and drainage facilities. These features being satisfactory, the necessary dimensions are added taking care to make them less prominent. Dimensioning has already been discussed on a previous page. Any features spoken of in the written specifications must be numbered on the drawing.

The selection of bushes, shrubs, and flowers must be done with care. Beds of early spring flowers, early, middle, and late summer flowers must be studied as to location so that at all times the yard will have something in bloom. There are many varieties of bushes that have blossoms and these can be placed according to the time of the year they blossom. The basic idea is to have the yard interesting all the year or all the summer. Border shrubs do not blossom, but their constant green can be used for effect. Flowers should also be selected with color schemes in mind. The planning of an interesting yard, therefore, includes a careful study, of blossom periods, color, and growth of all flowers and bushes.

Inking. The pencil layout being satisfactory, inking can be started. Black India ink is generally used although colored India inks may be used.

Instruments may be used to ink in the plan of the house, driveways, sidewalks (concrete or brick) and other purely mechanical objects. However, for all bushes, shrubs, trees, flowers, grass, etc.,

freehand work must be done. Examples of this can be seen in Figs. 82, 83, and 86. The lines are all free in method and dark or light according to the contrast desired. Considerable practice is necessary, as in other rendering work, but it can be quite easily mastered.

Practice. The student is advised to draw landscapes, such as shown in this material, practicing all symbols carefully. Your drawings should eventually look equally as good as those shown here.

Relation of Landscaping to Rendering. A landscape drawing and a perspective rendering must show exactly the same thing, the only difference being that one is a plan view and the other an elevation view. For example, trees are shown in an exact location on the landscape drawing and so they must be shown in the same relative position on the rendering. Or, if a bush is shown at one corner of the house in a landscape drawing that same tree must be shown at the same corner of the house in the rendering.

A rendering rarely shows the entire lot but that part of the lot that is shown must be accurate as to the location of trees, walks, drives, etc. Before drawing the rendering, a point on the landscape drawing can be designated as the station point which will easily determine relative positions of all objects for the rendering.

PRACTICE PROBLEM

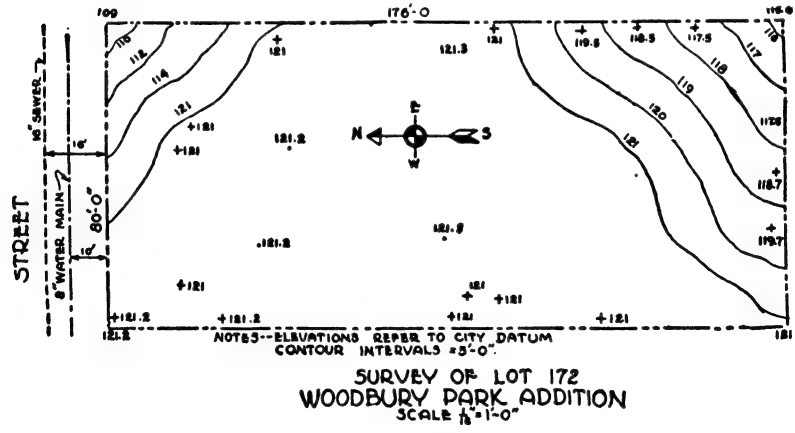


Fig. 87. Typical Survey Which Can Be Used by the Student as a Practice Problem from Which to Make a Rendering. Use Fig. 39 as the Plan

INDEX